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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR and Eastern Europe. The information selected is intended to indicate current scientific developments and activities and is disseminated as an aid to research in the United States.

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I. BIOLOGY

Microbiology

1. Diphtheria Anatoxin Aerosol Prepared

"Quantitative Determination of Diphtheria Anatoxin Aerosol," by S. N. Muromtsev, V. P. Nenashev, N. A. Boroduyuk, and P. I. Basmanov, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 8, Aug 60, pp 47-50

The author notes that the practical use of the inhalation method of immunizing against different infections depends on the resolution of a number of problems such as the development of an apparatus for preparing the aerosols, the methodology of determining the size of their particles, the determination of the concentration of a preparation after it has been dispersed in the air, and the immunization schedule. This report contains data on determining the concentration of a preparation dispersed in the air inside an inhalation chamber.

The experiments discussed were performed with two preparations of diphtheria anatoxin -- a live purified concentrated anatoxin and a dry lyophilized anatoxin. A glass sprayer was used to produce the liquid anatoxin aerosol. The maximum size of the particles dispersed in the air was 8-10 microns; about 0.1 ml of liquid per minute per 4.75 liters of air under a pressure of 220-240 mm was dispersed. The dry anatoxin was first carefully pulverized in a porcelain mortar and was dispersed for 2-3 minutes by a special sprayer for powdered materials; the rate of air flow was 5-10 liters per minute. The particle size in this case fluctuated from one to 20 microns.

The spraying was done in special chambers with different dimensions. Fibrous FPA-15 filter material, insoluble in water, was used to trap the anatoxin aerosol. The filter material was placed in special filter holders with input and output apertures and had a working surface of $3cm^2$. The amount of air passed through the filters was determined according to rate and time.

A number of experiments had been performed in advance on a bacterial aerosol model, as a result of which it was established that FPA-15 filter material with a resistance of 1-2 mm of water is entirely suitable for trapping aerosols.

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The anatoxin left on the filter was washed with 25 ml of physiological solution for 10-15 minutes. The amount of anatoxin extracted was determined by the complement fixation reaction; further details of the calculation are given.

Four tables show the results of the experiments: (1) the concentration of live diphtheria anatoxin in the sprayer before and during the spraying process; (2) the concentration of diphtheria anatoxin in the air at the sprayer outlet; (3) the concentration of diphtheria anatoxin in the chamber when the live preparation was used; and (4) the concentration of diphtheria anatoxin in a chamber with a 30 liter capacity when the dry preparation was used.

The following conclusions are given on the basis of these results:

1. The use of FPA filter material with a resistance of 1-2 mm of water permitted us to determine the concentration of a diphtheria anatoxin aerosol with particles of 8-10 microns upon spraying of a liquid preparation, and particles of 1-20 microns upon spraying of a dry preparation.

2. The complement fixation reaction can be used to determine the amount of anatoxin on the filter.

3. The concentration of liquid diphtheria anatoxin in the sprayer remained constant during the dispersing process.

4. A gradual increase in concentration in the air of the chamber was observed after dispersal of liquid diphtheria anatoxin.

5. Dispersal of dry diphtheria anatoxin with a particle size of 1-20 microns guaranteed a high concentration of the preparation in the air of the experimental chambers immediately after dispersal, which diminished rapidly after the cessation of dispersal of the material.

6. The dispersal of purified, highly concentrated preparations of diphtheria anatoxin in chambers with a volume of 30-640 liters permitted us to obtain a comparatively high concentration of anatoxin in the aerosol state in one liter of air -- up to 4.5-12 AE upon the dispersal of liquid, and up to 24 AE upon the dispersal of dry preparation.

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2. Botulinus Toxin Detoxified With Methylene Blue

"The Photodynamic Action of Methylene Blue on Type A Botulinus Toxin," by Yu. Z. Gendon, Materialy po Obmenu Opytom G. Upr. In-tov Vaktsin i Syvorotok M-va Zdravookhr.SSSR. (Data on Exchange of Experience of the Main Administration of Institutes of Vaccines and Sera of the Ministry of Health USSR), 1/54, 1958, pp 79-83 (From Referativnyy Zhurnal Biologiya, No 12, 25 Jun 60, Abstract No 54429, by V. Roykhel')

"Botulinus toxins obtained under ordinary conditions and cultured in cellophane bags were studied. Undiluted toxins were placed in a Petri dish on ice so that the temperature would not exceed 10° C. A determined amount of methylene blue was added to the Petri dish. Irradiation was performed with an electric lamp with a mirror reflector. The harmlessness of the toxin was determined by means of intraperitoneal introduction to mice. Toxins which did not kill mice for four days after the introduction of one milliliter were considered harmless. It was shown that undiluted toxins obtained under ordinary culturing conditions were rendered harmless in 28-35 hours, and 'cellophane' toxins, 3-4 hours later. The loss of toxic activity was stable, the toxins remained harmless after 5-7 months of preservation in a refrigerator. The antigenic characteristics of the photodynamic toxoids were much less well preserved than those of the anatoxins. The antigenic characteristics of the 'cellophane' photodynamic toxoids were disturbed to a greater extent than were those of the ordinary photodynamic toxoids."

CPYRGHT

3. Phagocytosis Altered by Toxins

"Changes in Phagocytosis Indexes Under the Effect of Toxins of Certain Pathogenic Anaerobic Microorganisms (Preliminary Report)," by O. A. Kotylev, Sb. Rabot. Leningr. Vet. In-t (Collection of Works of Leningrad Veterinary Institute), No 21, 1958, pp 253-257 (From Referativnyy Zhurnal Biologiya, No 12, 25 Jun 60, Abstract No 54399)

"It was established that the toxins of four basic types of Clostridium perfringens and also the toxins of Cl. septique and Cl. oedematiens decrease the phagocytic activity of leucocytes of horses and rabbits, whereas this activity in sheep is increased.

"The addition of type-specific antiserum to the liquid removes the depressing effect of the toxin on the phagocytic activity of horse leucocytes."

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4. Virulence of P. pestis Strains Studied

"The Problem of Changes in the Virulence of the Plague Microorganism in the Process of a Natural Epizootic," by V. M. Taranova, Tr. Rostovsk. n/D Gos. N.-I. Protivochumn. In-ta (Works of the Rostov-on-Don Scientific Research Anti-Plague Institute) No 13, 1957, pp 155-156 (From Referativnyy Zhurnal Biologiya, No 12, 25 Jun 60, Abstract No 54372, by V. Roykhel')

"The virulence of 17 strains of Pasteurella pestis isolated from fleas, ticks, and gerbils was studied in mice for two seasons. The relatively high virulence of plague pathogens at the beginning of an epizootic was established. At the end of April and the beginning of May, the LD_{50} was 115, 135, 130, and 25 microbial cells. Toward the middle of May, the LD_{50} decreased, and toward the end of May and the beginning of June reached 8-10 microbial cells."

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5. P. pestis Strain Compatibility

"The Interrelationship Between Strain of B. pestis; Highly Virulent Glycerine-Positive and Vaccine Glycerine-Negative EV," by M. F. Shmuter and N. A. Stolchenova, Tr. Astrakhansk. Protivochumn. St. (Works of the Astrakhan Anti-Plague Station), No 2, 1957 (1958), pp 95-99 (From Referativnyy Zhurnal Biologiya, No 12, 25 Jun 60, Abstract No 53881, by A. Shevelev)

"In joint culturing on bouillon containing 0.5% dried blood and 1% 'culture medium' lysate prepared by Karpuzidi's method (seeding was done in such a manner that one milliliter of medium contained 100 microbial cells of each strain), the seeding dose of both strains was 1-10 microbial cells; in seeding on ordinary bouillon, the dose of strain EV was 100 times larger than the dose of highly virulent strain No 297 (10 microbial cells), as a result of which an apparent suppression of the growth of the strain was noted. No antagonistic interrelationship between vaccine and virulent B. pestis strains over the course of seven passages (the colonies of these two strains which were clearly distinguishable were counted) was established after seeding on an agar medium containing blood and 'culture medium' lysate of 0.1 ml from the sixth and seventh test tubes of ten-time dilution of a culture after 5 days of incubation in a thermostat. The relationship of both strains to glycerine was also unaltered."

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6. Classification of Pasteurella

"The Characterization and Taxonomy of Pasteurella," by I. A. Dan'shev, Tr. Saratovsk. Zoovet. In-ta (Works of the Saratov Zooveterinary Institute), No 7, 1958, pp 50-63 (From Referativnyy Zhurnal Biologiya , No 12, 25 Jun 60, Abstract No 54370, by V. Roykhel')

"The author's observation of the species of 342 strains of Pasteurella isolated from corpses of different species of animals which had died of pasteurellosis are summarized. It was observed that Pasteurella isolated from different species of animals were identical according to their morphological and tinctorial characteristics and had polymorphism of cellular composition. No connection was noted between the form of the colonies and the biochemical, virulent, and other characteristics of the strains. The general cultural properties of different strains of Pasteurella are indicated and their complete biochemical characterization is presented. On the basis of the latter, the biochemically typical and atypical groups of Pasteurella differ. Cultural-biochemical and serological characteristics can not be used for intra-species differentiation. Four groups of cultures were isolated according to a degree of agglutinability. The literature on the antigenic relationship of Pasteurella to Brucella and paratyphoid pathogens was not substantiated. The capability of Pasteurella to produce highly toxic exotoxins which can be transformed into anatoxins under the effect of formalin was demonstrated. Upon introduction to animals, the anatoxins caused the formation of antibodies. The toxigenicity depended on the age of the culture. White mice and rabbits were susceptible to infection with Pasteurella of any origin. Pasteurella from birds was more virulent for pigeons than Pasteurella from mammals. Numerous passages through white mice brought about either an increase or a decrease in virulence accompanied by regular reduction of enzymatic activity. The possibility of establishing sterile immunity was demonstrated. Pasteurella were weakly resistant with respect to the action of external factors under ordinary conditions of culturing or preservation. Pasteurella were highly resistant in a dried state."

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7. Vibrio Strain Compatibility

"The Interspecies Interrelationship of Vibriones," by A. G. Nikonov, R. M. Sayamov, and K. G. Bichul', Tr. Astrakhansk. Protivochumn. St. (Works of the Astrakhan Anti-Plague Station), No 2, 1957 (1958), pp 423-437 (From Referativnyy Zhurnal Biologiya, No 12, 25 Jun 60, Abstract No 53882, by A. Shevelev)

"Interspecies relationships were studied on four strains of Cholera and six strains of paracholera, and also on strain B of Finkler-Prior No 10 Vibrio. The percentage content of the various strains in mixed

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cultures were determined by seedings of 100 isolated colonies on slant agar, and the agglutination reaction with O-sera against each strain was performed. The antagonistic nature of the relationship between cholera and paracholera B in experiments in vitro and in vivo was established. The end result depends to a great extent on the nature of the medium in which the Vibrio was cultured. The presence of antagonism becomes apparent in some cases during the first day of culturing, in others on the 6th to 8th day or later, which must be considered in initiating corresponding experiments."

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8. Antagonism Between Cholera Vibriones

"The Intraspecies Interrelationship of Cholera Vibriones," by A. G. Nikonov, R. M. Sayamov, and K. G. Bichul', Tr. Astrakhansk. Protivochumn. St. (Works of the Astrakhan Anti-Plague Station), No 2, 1957 (1958), pp 438-447 (From Referativnyy Zhurnal Biologiya, No 12, 25 Jun 60, Abstract No 53883, by A. Shevelev)

"Three strains of the Inaba type and three strains of the Ogava type were used in the experiments. The presence of antagonism in experiments in vitro appeared within 15-45 hours after seeding, and in experiments on guinea pigs within a few hours after infection. There are two possible explanations of the results obtained: either the Inaba or the Ogave type is not a type according to activity but is a different species of cholera Vibrio, or there are local, concurrent interrelationships between different variants of the same species. The authors tend to favor the latter viewpoint and conclude that the determination of the nature of intra- and inter-species relationships cannot serve as a criterion for the distinction of species forms from variants."

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Phytopathology

9. Antigenic Characteristics of Lucerne Tuber Bacteria Studied

"A Study of Certain Serological Characteristics of Tuber Bacteria of Lucerne," by K. F. Filippova, Izv. Yestestvennonauchn. In-ta pri Permsk. Un-te (Bulletin of Natural Sciences of the Institute at Perm University), Vol 14, No 2, 1958, pp 51-57 (From Referativnyy Zhurnal Biologiya, No 12, 25 Jun 60, Abstract No 53937)

"The investigations showed that tuber bacteria of lucerne which were cultured in different soils belong to different serological groups. The different antigenic characteristics are connected with the physiological activity of the bacteria."

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10. Radiation-Induced Cell Division Inhibition Linked to Participation of the Nucleus.

"Radiation Injury of the Nucleus as the Determining Factor in Inhibiting the Process of Cell Division," by I. M. Shapiro, N. N. Rott, and I. T. Rass, Institute of Animal Morphology imeni A. N. Severtsov, Academy of Sciences USSR, and Helminthological Laboratory, Academy of Sciences USSR; Moscow, Zhurnal Obshchey Biologii, Vol 21, No 4, Jul/Aug 1960, pp 289-296

Although it has been established that ionizing radiation inhibits cell division, the mechanism of this action has remained unexplained. Therefore, the purpose of the research described was to investigate the role of injury to the cell nucleus in the mechanism of cell division inhibition due to radiation.

Various aspects of the problem are described and discussed, and a table and six graphs accompany the article.

The author presents the following conclusions:

"X-irradiating either gamete of the loach (Misgurnus fossilis L.) by 30-40 kr causes an almost equal delay in cell division; however x-irradiating the embryo at the stage of 2-4 blastomeres by the same dose does not inhibit cell division. Cleavage of the loach eggs occurs independently of the extent to which the chromosomal complex remains intact. X-irradiation by 1-2 kr doses at the middle blastula stage causes a delay in cell division which is five times as long as the delay following irradiation of the zygote by a 40 kr dose. No inhibition of cell division occurs after x-irradiating the embryos at the middle blastula stage by a 2 kr dose if the embryos were previously irradiated by 50 kr at the 2-4 blastomere stage. X-irradiating the Ascaris suum zygote or embryos at the 2-4 blastomeres stage temporarily inhibits cell division. The delay of cell division is linked to radiation injury of the nucleus. Radiation probably inhibits the division of only those cells in which the nucleus participates in preparing for the regular cycle of cell division."

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11. Radioactive Cobalt Metabolism in Fish

"Certain Problems of the Behavior of Radioactive Cobalt in the Fish Organism," by L. K. Frolova, Laboratory of Physiology of the All-Union Scientific Research Institute of Marine Fishing and Oceanography; Moscow, Zhurnal Obshchey Biologii, Vol 21, No 4, Jul/Aug 60. pp 301-305

The author conducted various tests on radiocobalt metabolism in fish; his conclusions are as follows:

1. Cobalt which is ingested by fish along with water and food is rapidly distributed in all of the organs, and then it is rapidly eliminated.

2. Cobalt which is injected into the fish is retained for longer periods than that which is ingested with water and food, and a small portion of it is eliminated over a long period.

3. Cobalt is gradually redistributed among the various organs of the fish; the liver and kidneys are the sites of cobalt concentration.

4. Water temperature has a great effect on cobalt distribution and the rate of its elimination.

5. All mechanisms connected with cobalt distribution, site of concentration, and rate of elimination from the fish coincide with data obtained for higher vertebrates.

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12. Initial Radiation Injuries of the Bone Marrow

"Concerning the Mechanism of Early Radiation Injuries of the Bone Marrow," by S. Ya. Rapoport and S. M. Gasanova, Institute of Biological Physics, Academy of Sciences USSR; Moscow, Biofizika, Vol 5, No 4, Jul/Aug 60, pp 454-460

The purpose of the research described was to study the role of the nervous system in the mechanism of the onset and development of early radiation injuries of the bone marrow as shown by the method of luminescence microscopy.

Rats X-irradiated by 800-1,000 r were the experimental animals. The authors present the following conclusions:

1. Early radiation damages of the bone marrow which are detectable by luminescence microscopy arise only as the result of the direct irradiation of the bone marrow.

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2. Early damages of the bone marrow due to the whole-body irradiation of an animal are considerably more severe than damages inflicted by the irradiation of one extremity.

3. The administration of novocain or of atropine both before and after whole-body irradiation of the animal alleviates injury to the bone marrow, and diminishes the difference which is usually evident after whole-body irradiation and the irradiation of one extremity. The administration of these substances does not affect the reaction of the bone marrow following the irradiation of one extremity.

4. The disruption of bone marrow nerve connections or the separate exclusion of the receptors of the peritoneal cavity before whole-body irradiation of the animals also reduce the difference in damage to the bone marrow following whole-body irradiation and the irradiation of one extremity.

5. Data obtained indicate that the early damages to the bone marrow following whole-body irradiation of an animal are the result of both the direct action of X-rays on the bone marrow and on the nerve reflex reactions, the initial link of which is stimulation of the receptors of the abdominal cavity.

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13. Molecular Morphology and DNA Radioresistance

"Concerning the Relationship Between the Molecular Morphology of Macromolecules of DNA and Their Radiosensitivity (The Problem of Radiosensitive and Radioresistant Forms of DNA)," by P. I. Tseytlin, D. M. Spitkovskiy, and N. P. Ryabchenko, Institute of Experimental Biology, Academy of Medical Sciences, USSR; Biofizika, Vol 5, No 4, Jul/Aug 60, pp 393-397

In previous research, the authors noted that the DNA molecule exists in two different forms, i. e., an extended and a contracted form. The purpose of the research described was to present a comparative evaluation of the configurational radiation sensitivity of the extended and contracted forms of DNA. The reversible contraction of the DNA molecule is brought about by changing the pH of the medium in a specially designed apparatus.

The methodology is presented in detail and two tables and a diagram show the relationship between the radiation sensitivity of the DNA macromolecules and their configurational condition. Various mathematical formulae show the derivation of the ratio between the radiation resistance and the size of the DNA molecule. The DNA molecules which were contracted by 30% were found to be much more resistant to ionizing radiations than the original forms of DNA molecules.

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Judging by the data obtained, the authors conclude that the presence of radiation-resistant and radiation-sensitive forms of DNA is linked to the configurational characteristics of the latter.

14. Shifts in Pupillary Reactions Indicative of the Functional Condition of Chronically Irradiated Animals

"Concerning the Pupillary Reactions of Rabbits Injured by Small Quantities of Sr^{90}," by A. M. Ivanitskiy; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, Vol 50, No 8, Aug 60, pp 83-86

An important sequela of injury of an organism by radioactive substances is the shift in its reactivity to drugs. In the research described, the author studied the characteristic of pupillary reactions, chiefly to pharmacological agents, of rabbits injured by radioactive strontium administered daily in amounts of 5 microcuries/kg over a period of 2 1/2 months.

More than 200 determinations of the size of the pupils of ten rabbits were made.

Results show a weakened pupillary reaction to light, and an intensified reaction to pharmacological substances such as morphine hydrochloride, nicotine, and tetraethylammonium iodine, which affect the central nervous system and the ganglionic apparatus. The pupillary reaction to pilocarpine hydrochloride and homatropine hydrobromide was unchanged.

The author concludes that these results verify the advisability of using the pupillary reaction as an index of the functional condition of an organism subjected to the effects of chronic irradiation.

15. Concepts of Irradiation Dose and Absorbed Dose Elucidated

"The Relationship Between the Irradiation Dose and the Absorbed Dose," by Yu. V. Sivintsev; Moscow, Atomnaya Energiya, Vol 9, No 1, Jul 60, pp 39-47

This article points out discrepancies between the concept of the "irradiation dose" and the "absorbed dose." Concrete formulae for calculating the absorbed dose based on the measurement of the absolute dose of irradiation are presented. Conditions for electrical equilibrium during the dosimetric measurements of roentgen and gamma-irradiation of various energies at a range of 200 kev to 32 Mev are described.

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16. Breakdown of the Starch Molecule Under the Effect of Gamma-Irradiation

"A Study of the Breakdown of Starch Under the Effect of Gamma-Irradiation," by V. F. Oreshko and K. A. Korotchenko, Moscow Technological Institute of the Food Industry; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Pishchevaya Tekhnologiya, No 2 (15), 1960, pp 17-21

It has been established that the breakdown of starch increases in proportion to the absorbed dose of gamma-irradiation, while the formation of gaseous products increases in proportion to the square of the dose. The constants of the rate of these processes under the effect of doses equal to 1.0 to 18.2 million roentgens remain fixed.

The breakdown of the starch molecule under the effect of ionizing radiations occurs at the 1-4 linkage and at the 1-6 linkage in the vicinity of the branchings. This is confirmed by decreased viscosity, the formation of formaldehyde, and the anhydride type reaction products. The products which are formed under the effect of ionizing radiations behave like soluble starches.

17. Toad Adrenal Secretion Normalizes Radiation-Inhibited Oxidation-Reduction Processes

"Change of Oxidation-Reduction Processes in Hemopoietic Organs During Radiation Sickness," by A. I. Robu, Chair of Pathological Physiology, Kishinev Medical Institute; Kishinev, Zdravookhraneniye Moldavskoy SSR, No 2, Mar/Apr 60, pp 56-61

In the research described, rats were X-irradiated by lethal (700 r) doses, and poison secreted from the toad's adrenal medulla (1 ml diluted 1/1,000 in physiological saline solution) was administered subcutaneously as a respiration stimulating agent.

The methodology is explained in detail, and various diagrams substantiate the experimental results.

The author presents the following conclusions:

1. The irradiation of an organism by penetrating radiation in doses of lethal magnitude causes the inhibition of tissue respiration and of the activity of the enzymes present in the hemopoietic organs. The degree of inhibition corresponds to the severity of the course of radiation sickness.

2. The toad adrenal medulla secretion which was used in this research normalizes the condition of oxidation-reduction processes in the hemopoietic organs during radiation sickness.

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Fuels and Propellants

18. The Critical Diameter and Velocity of Detonation of Liquid Ozone Solutions

"The Critical Diameter and Velocity of Detonation of Liquid Ozone Solutions," by Ye. I. Gribova, S. A. Kamenetskaya, A. V. Pankratov, A. Ya. Apin, and S. Ya. Pshezhetskiy, Physical Chemistry Institute imeni L. Ya. Karpov, Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 7, Jul 60, pp 1395-1401.

An investigation of the explosion of liquid ozone and its solutions established that the explosion properties of ozone are determined chiefly by the nature of the kinetics of ozone decomposition, in particular by the low value of the activation energy and the large exponential coefficient (frequency factor). The relationship found between the critical diameter and composition of the solution is in conformity with the relationship that follows from Yu. B. Kharitor's theory of the critical diameter of stable explosions.

According to Khariton, the critical diameter of an explosive is defined as the minimum diameter of a cylindrical charge at which a stable detonation of the charge takes place with a constant velocity. The critical diameter of the charge is proportional to the duration of the reaction at the front of the detonation wave; this duration is inversely proportional to the velocity of the reaction. Khariton's theory relates the detonation process to the kinetics of the chemical reaction taking place at the front of the detonation wave. It appeared of interest to establish a correlation between the critical diameter and the kinetics of the reaction determined under conditions when no explosion takes place. This is possible only when the mechanism of the slow reaction in the absence of an explosion and the mechanism of the reaction at the front of the detonation wave are the same. This condition is fulfilled in the case of ozone.

By exploding ozone diluted with oxygen and carbon tetrafluoride, which were used as solvents, Khariton's assumption to the effect that mixtures of explosive substances with inert diluents must be regarded as explosives with a lowered heat of detonation and a reduced temperature at the detonation front could be checked.

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19. Dependence of the Yield of Nitric Oxide On the Temperature of the Explosions of Ozone-Nitrogen Mixtures

"The Physical Chemistry of Concentrated Ozone; Part 4 -- Dependence of the Yield of Nitric Oxide on the Temperature of the Explosion of Ozone-Nitrogen Mixtures" by B. V. Strakhov, V. P. Yegorov, V. P. Lebedev, and N. I. Kobozev, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 7, Jul 60, pp 1524-1527.

In earlier work by the authors it was established that the dependence of the yield of nitric oxide (NO) on the initial concentration of ozone in N_2-O_3 mixtures after explosive oxidation has taken place in such mixtures can be expressed by a curve which exhibits a maximum. At constant initial pressures (100 and 150 mm Hg), the maximum yield corresponds to 75-80% of ozone by volume. The position of the maximum depends on two factors, the composition of the initial mixture and the explosion temperature.

In the work reported at present, the dependence of the nitric oxide yield on the explosion temperature in the explosive oxidation of nitrogen-ozone mixtures was investigated. The explosion temperature was controlled by introducing into the explosion pipette stoichiometric methane-ozone mixtures. It was found that at a constant temperature (measurements were carried out at 3000°K and 3500°K) the maximum yield with respect to composition occurs at 40% of O_3 by volume. The yield of nitrogen oxide at constant composition (65% O_3 + 35% N_2) increases from 0.6% at 2500°K to 3% at 4250°K. The experimental data may be explained assuming that the yield is parallel to the thermodynamic equilibrium in the reaction

$$N_2 + O_2 \rightleftharpoons 2\ NO$$

at the temperature of the explosion.

At the explosion temperatures studied, the yields of NO were still far removed from those corresponding to thermodynamic equilibrium.

20. Some Reactions of Lithium Peroxide

"Investigation of the Interaction of Lithium Peroxide with Water Vapor and Carbon Dioxide" by K. I. Selezneva, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences, Moscow; Zhurnal Neorganicheskoy Khimii Vol 5, No 8, Aug 60, pp 1688-1695

Investigation of the interaction of lithium peroxide with water vapor in the temperature range of 23-300° indicated the following.

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1. Up to 200° lithium peroxide is practically not decomposed by water vapor. The interaction of lithium peroxide with water vapor at 23° results in hydration with the formation of $Li_2O_2 . H_2O$ and partial formation of $LiOH.H_2O$. Formation of the latter compound is accompanied by the evolution of a small quantity of oxygen.

2. At temperatures above 200° lithium peroxide reacts with water vapor to a significant extent under formation of lithium hydroxide and evolution of an equivalent amount of oxygen.

3. At the temperature of 300° and higher temperatures, there is thermal decomposition of Li_2O_2 in addition to the chemical interaction of lithium peroxide with water vapor.

Investigation of the interaction of lithium peroxide with dry carbon dioxide established that formation of carbonate begins to take place to a significant extent at a temperature above 200° and then gradually diminishes. During one hour, only one third of the lithium peroxide is transformed into carbonate. The rate of the formation of carbonate then strongly diminishes because the diffusion resistance increases.

Investigation of the interaction of lithium peroxide with carbon dioxide in the presence of water vapor indicated that absorption of carbon dioxide, to a noticeable extent, begins to take place at 200°. One may assume that at the temperatures of 100°, 150° and 200° carbon dioxide is absorbed by lithium hydroxide formed as a result of the hydrolysis of lithium peroxide by the water vapor and the water separated in the reaction of the formation of carbonate from the lithium hydroxide.

21. Chain and Molecular Reactions of Intermediate Compounds Formed in the Oxidation of n-Decane

"Chain and Molecular Reactions of Intermediate Compounds Formed in the Oxidation of n-Decane," by Z. K. Mayzus, I. P. Skibida, N. M. Emanuel', and V. N. Yakovleva, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Kinetika i Kataliz, Vol 1, May/Jun 60, pp 55-62

In the course of the complex chain reactions of the oxidation of hydrocarbons, many intermediate products are formed which participate in subsequent reactions. It is essential to investigate the mechanism of the reactions in which these intermediate substances participate, establishing first of all whether these reactions are of the chain or molecular type. During the oxidation of n-decane in the liquid phase, hydroperoxides, alcohols, and ketones are formed in considerable quantities. To investigate the transformations of these intermediate substances, α -naphthol,

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which is a strong inhibitor capable of completely stopping chain processes, was introduced into the reaction mixture. By using this method, it was possible to differentiate within the overall complex processes reactions which proceed by a chain mechanism and to determine the interrelationship between chain and molecular reactions leading to the disappearance of intermediate products of oxidation.

The velocity constant of the decomposition of peroxides derived from n- decyl ("n-decyl hydroperoxides") in n-decane in the presence of α - naphthol was compared with the velocity constant of the branching of chains measured by the inhibitor method. It was established that the reaction of chain branching represents a non chain decomposition of hydroperoxides into radicals. The correspondence between the quantities of alcohols that had formed and the quantity of decomposed hydroperoxides indicated that RO radicals are formed by the elementary reaction of the decomposition of hydroperoxides.

It was furthermore established that the formation of free radicals (the reaction of chain branching) proceeds in two parallel ways:

1. By the monomolecular decomposition of the hydroperoxide according to the equation $ROOH \longrightarrow RO + OH$.

2. By the bimolecular interaction of the hydroperoxide with the hydrocarbon according to the equation $ROOH + RH \longrightarrow RO + H_2O$.

The velocity constant of the bimolecular reaction of branching increases with the reduction of the strength of the R-H hydrocarbon bond in the sequence decane < isodecane < ethylbenzene < methyl oleate.

The alcohols and ketones which form during the process of the oxidation of n-decane undergo further transformations only by chain reactions.

22. USSR Developments in the Field of Cyclone Furnace Technology

"The Beneficial Cyclone," by G. F. Knorre, Honored Worker of Science and Technology of the USSR, Doctor of Technical Sciences, Professor at the Moscow Higher Technical School; Ye. A. Nakhapetyan and M. A. Nadzharov, Candidates of Technical Sciences, Senior Scientific Associates at the Moscow Department of the Central Boiler and Turbine Institute; Moscow, Izobretatel' i Rationalizator, No 4, Apr 60, pp 20-21

Application of high temperatures is typical for the firing processes employed in present-day engineering. For this reason, temperature-dependent chemical reactions proceed at very high velocities during the firing. One

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of the drawbacks of letting fuels burn at high velocities is the fact that perfect mixing of the air with the fuel does not take place because of the short time which is available. To bring about complete combustion of every particle of fuel, one must add an excess of air. The excess air is not used up in chemical reactions. Energy contained in the fuel must be expanded for heating this air, with the result that there is a considerable lowering of the temperature in the combustion chamber. When gaseous or liquid fuel is used, the situation is not too adverse. However, when solid fuel is burned, it is very difficult to achieve combustion at the required level of intensity. To improve the mixing of the fuel with the air, combustion in cyclone chambers is applied. When the fuel is burned in cyclone furnaces, the excess of air can be reduced to the theoretical amount required and the temperature in the furnace space raised by this means.

Although the principle of cyclone combustion is of the greatest interest as far as applications in power engineering are concerned, there are many other possibilities of applying this principle.

The characteristics of the cyclone process are such that application of cyclone combustion appears promising for the most diverse heating processes. The unit capacity of boiler installations being planned at present is so great that the principles underlying the design and construction of such installations must be revised henceforth. One must, above all, reduce the dimensions of these installations and the amount of metal required for constructing them.

The only type of heating which is capable of increasing greatly the intensity of combustion of solid fuel at present is heating within a cyclone furnace. However, not all types of fuel applied in USSR industry can be burned in cyclone furnaces. This applies primarily to fuels which form a high-melting and very viscous ash and also fuels which contain a greatly reduced amount of combustible material. Before the cyclone principle is introduced on an extensive scale into power engineering and heat generation, one must investigate the problems involved under pilot plant conditions in work done on an experimental scale. Work along these lines is already being conducted at the Moscow Higher Technical School in collaboration with the Moscow Department of the Central Boiler and Turbine Institute. The preliminary results that have been obtained make it possible to conclude that the problem will be successfully resolved within the next few years.

Development of satisfactory methods for the burning of high-viscosity cracking mazuts in boiler furnaces is no less important from the standpoint of progress in present-day heat and power engineering. On the basis of results obtained outside the USSR, one must conclude that intensive combustion of fuel of this type can be carried out in a satisfactory manner by using cyclone furnaces.

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Cyclone combustion may yield good results when applied in connection with the operation of gas turbines. This refers to the combustion of both liquid fuel and solid fuel in a powdered state under pressure. Combustion of solid fuel in gas turbine installations by the old burner method is inadvisable. To carry out a process of this type, one must build very large installations and develop elaborate methods for capturing suspended slag. However, this problem must be investigated in detail under laboratory conditions. Results obtained in work of this type will definitely solve the problem as to whether solid fuel can be burned in gas turbines. At present, investigations on the subject are being conducted at the Central Boiler and Turbine Institute (Leningrad) and are being planned at the Moscow Higher Technical School.

The cyclone principle can be employed at diverse types of technological production installations. An article published in Izobretatel' i Rationalizator No 1, January 1960, describes successful application of the cyclone principle in the production of matte in the copper smelting industry. The work in question was conducted at the Power Engineering Institute of the Kazakh Academy of Science, originally under laboratory conditions and then under industrial conditions, using an experimental furnace installed at the Balkhash Plant. By using a cyclone furnace the rate of the conversion was increased sharply and the concentration of copper in the matte raised considerably. (In issue No 1, January 1960, of Izobretatel' i Ratsionalizator, the laggardness of individual officials of the Gosplan USSR is criticized in taking measures that would expedite the introduction into the USSR national economy of applications of the cyclone furnace invented by G. F. Knorre, M. A. Nadzharov, A. V. Tonkonogiy, Candidate of Technical Sciences, and A. B. Reznikov, Doctor of Technical Sciences.)

Recently the Institute of Fertilizers and Insectifungicides imeni Samoylov, in cooperation with the Chair of Industrial Combustion Engineering ["Ognetekhnika"] of the Moscow Power Engineering Institute carried out successful tests on the application of furnaces of the cyclone type for the complete roasting of pyrites combined with the production of sulfuric acid and also for the elimination of fluorine from phosphates to produce fertilizers and phosphate concentrates which can be added to animal fodder.

Of considerable interest is the application of the cyclone principle in ferrous metallurgy for the preliminary melting and superheating of an open hearth charge consisting of ore concentrates and powdered lime. Experimental investigations to check the suitability of cyclone smelting equipment for applications designed to improve the efficiency of steel production are being conducted at present at the Moscow Higher Technical School imeni Bauman.

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Application of the cyclone principle for the direct reduction of iron oxides is not out of the question. It may also be possible to apply processing in a cyclone furnace for the production of high-quality cement from shale ashes and the recovery of rare metals from the ashes of coal burned at power plants.

Cyclone furnace equipment in which fuel is burned or a chemical process is carried out can be easily equipped with automatic control appliances so that the process is automatized. One must assume that application of cyclone furnace equipment will be of advantage when a higher rate of mixing and more rapid heat exchange are desired in continuous chemical processing.

23. A Generalized Relationship for the Viscosity of Distilled Fuels

"A Generalized Relationship for the Viscosity of Distilled Fuels," by T. A. Kolach, and V. B. Zenkevich, Moscow Order of Lenin Power Engineering Institute; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 7, 1960, pp 95-98

An experimental determination was made of the viscosity of five distilled fuels in the temperature interval 20-100° C. The measurements were made on a Pinkevich type capillary viscosity meter. Results obtained were generalized to a single curve, using the parameters obtained, based on the average volume temperature of boiling off of petroleum products.

The method can be applied for the approximate calculation of the relationship between the viscosity of related petroleum products and temperature on the basis of a minimum amount of data available.

24. On the Relative Reactivity of Radicals

"On the Relative Reactivity of Radicals," by Kh. S. Bagdasaryan, Physical Chemistry Institute imeni L. Ya. Karpov; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 7, 1960, pp 1517-1523.

The method proposed by Szwarc for determining the relative reactivities of radicals from the value for n in equation (1)

$$\lg \frac{k_{R_1A_i}}{k_{R_1A_o}} = n \lg \frac{k_{R_2A_i}}{k_{R_2A_o}}, \qquad (1)$$

lacks theoretical foundation and leads to results which are not in accordance with those obtained experimentally. The concept has been proposed of the

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"susceptibility" of the reaction with participation of a given radical or ion to the effect produced by a structural factor (e.g., a substituent) in a series of molecules of a definite type.

In the general case n lacks a simple physical meaning (just as the constant of Hammett's equation). In particular cases the value for n characterizes the relative structural susceptibility of reactions with participation of the radicals R_1 and R_2 in the common series of molecular species with which these radicals react.

25. Catalytic Oxidation of Methane and Methyl Alcohol

"Catalytic Oxidation of Methane and Methyl Alcohol," by N. S. Yenikolopyan and I. M. Bel'govskiy, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, no 7, 1960, pp 1571-1580.

The solution of the thermal conductivity equations showed that for usually observed reaction rates (rate of heat evolution and acceleration of the process) the system may be considered as stationary, i. e., the Koval'skiy separate calorimetry method is strictly applicable.

It has been shown that in the homogeneous oxidation of methane and methyl alcohol the maximum yield of the intermediate formaldehyde is greater in the latter case than in the case of oxidation of methane, which is in accordance with the higher reactivity of methyl alcohol.

A study of the oxidation of methyl alcohol on a silver catalyst showed that the process is completely heterogeneous and passes through the intermediate stage of the formation of formaldehyde which is mainly desorbed into space. The homogeneous oxidation of the formaldehyde formed, as well as of methyl alcohol, are completely suppressed owing to the rapid annihilation of active centers on the silver surface.

In the case of methane oxidation on a silver catalyst, the reaction evidently does not pass through the intermediate stage of formation of formaldehyde.

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26. Current Developments in the Synthesis and Application of Ion-Exchange Resins

"Development of the Synthesis and Applications of Ion-Exchange and Electron-Exchange Resins," by S. Ye. Bresler, Institute of High-Molecular Compounds, Academy of Sciences USSR; Moscow, Uspekhi Khimii, Vol 29, No 8, Aug 60, pp 993-1010

Recent developments in ion-exchange and chromatographic methods, present-day trends in the development of ion-exchange materials for inorganic ions, problems involved in the purification of organic substances, and the use of ion-exchange resins as catalysts in carrying out chemical reactions are discussed. In the section on ion-exchange and chromatographic methods, the application of electrodialysis through ion-exchange membranes for the desalting of water is discussed with a reference to the fact that this method is used extensively in the conversion of saline water and sea water to drinkable water, for instance on ships. It is also used in the treatment of water and conditioning solutions in connection with the production of antibiotics. As far as application of chromatographic procedures for industrial purposes is concerned, the author believes that the frontal method has the best possibilities. Applications of chromatographic procedures for the separation of transuranium elements and nitrogen isotopes are briefly touched on. Some information is given on the author's own investigations in the field of continuous chromatography with tapping of the product. This method is discussed on the example of the separation of a mixture consisting of 50% of Li and 50% of Na.

In the section on present-day trends in the development of ion-exchange materials, emphasis is placed on organic resins containing groups that are capable binding inorganic ions by chelation, the use of inorganic polymers (e.g., polymers with zirconium-oxygen or titanium-oxygen principal chains) as ion-exchange resins, and application of cellulose and starch as the basis for the synthesis of mildly acting ion-exchangers which would be suitable for the isolation of complex and sensitive substances such as proteins and viruses. Considerable attention is paid to the separation of uranium, thorium, and rare-earth elements by ion-exchange methods and the development of suitable ion-exchange materials for this purpose. The desirability of separating rare metals used in semiconductor technology (germanium, gallium, and indium) in the form of complex anions on anion-exchange resins is pointed out. The importance of the application of ion-exchange agents to absorb radioactive splinter elements formed as a result of the fission of heavy nuclei is stressed.

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In discussing the purification of organic substances, the author mentions the possibility of adsorbing acetylene on polymers that have keto groups, e.g., polymethylvinylketone (S. Ye. Bresler, Zhurnal Fizicheskoy Khimii, Vol 14, 1940, p 435).

On the basis of publications by S. Ye Bresler, G. V. Samsonov, and members of their group (five references), problems involved in the synthesis of special ion-exchange resins to be used in the separation and purification of large ions of physiologically active substances such as antibiotics, vitamins, and alkaloids are reviewed. It is pointed out that ion-exchange resins for the adsorption of large ions of this type must have large pores, i. e., they must be cross-linked to a small extent only and exhibit a relatively high swelling capacity for this reason. The synthesis of the KFUKh resin especially designed for the adsorption of streptomycin from culture liquids is described on the basis of a paper by Bresler and Samsonov (Antibiotiki, Vol 1, 1956, p 42). This resin is prepared by copolymerizing phenoxyacetic acid, chlorophenol, and formaldehyde.

It is brought out that the steric configuration of complex organic substances must be taken into consideration in synthesizing ion-exchange resins specially adapted for the adsorption of ions of these substances.

In the final section of the report, the application of ion-exchange resins and electron-exchange resins (redox-polymers) as catalysts in organic synthesis is discussed in some detail. The author regards this type of application as very promising. Because of the high specificity of the action of ion-exchange catalysts and the mild conditions under which reactions can be carried out when these catalysts are used, the author likens catalytically active ion-exchanger polymers to enzymes. Many examples of the application of catalysts of this type are given, among them the use of a mercury salt of sulfonated polystyrene in the hydration of acetylene (Kucherov-Hofmann reaction), the production of epoxides from olefins and peracids using a sulfonated polystyrene, and the production of hydrogen peroxide by a process involving fixation by means of a redox-resin of oxygen dissolved in water.

A bibliography consisting of 95 references, 11 of them USSR, is appended to the article.

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27. An attempt to Synthesize High-Molecular Organophosphorus Compounds Starting With Phosphoric Acid Anhydride and Aluminum Salts of Phenols

"Synthesis of Organophosphorus Compounds By the Interaction of Phosphoric Acid Anhydride With Aluminum Phenolates" by V. K. Kuskov, S. G. Fedorov, and S. I. Vol'fkovich, Moscow State University; Moscow, Izvestiya Akademii Nauk SSSR-Otdeleniye Khimicheskikh Nauk, No 7, Jul 60, pp 1200-1205

By condensing aluminum phenolate and aluminum cresolates with phosphoric acid anhydride, organophosphorus compounds have been prepared which do not dissolve in ordinary organic solvents, but are soluble in 5% caustic alkali or pyridine. By the nitration of substances which have been synthesized, trinitrophenol and trinitrometacresol were obtained. The hydroxyl groups contained in the substances which had been synthesized (i.e., their "hydroxyl numbers") were determined by acetylation. A sodium salt and a dibromo-compound derived from the product of the condensation of aluminum phenolate with phosphoric acid anhydride were prepared. On the basis of the results obtained, the assumption is made that high-molecular phosphorus compounds were synthesized which contain phenolic hydroxyl groups. Formulas for these compounds are proposed.

A combined polycondensation of aluminum phenolate, phosphoric acid anhydride, phenol, and paraformaldehyde was carried out.

Inorganic Chemistry

28. Aluminum Monochloride and Possibilities of the Use of This Compound in Processes for the Production of Aluminum from Ores

"Aluminum Monochloride," by S. A. Semenkovich; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 6, Jun 60, pp 1281-1285

Results obtained in an investigation of the system Al-AlCl-$AlCl_3$ that was carried out in 1948 at the All-Union Aluminum-Magnesium Institute are described. Thermodynamic data pertaining to the formation of AlCl from the metal and aluminum trichloride are reported. It was pointed out in several papers published recently that aluminum chloride can be employed for the production of aluminum from its ores and alloys. Alloys such as Al-Si-Fe and Al-Fe can be obtained by the reduction of aluminum ores with carbon in electrical arc furnaces. Following this, the aluminum can be separated from these alloys in the form of aluminum monochloride. If a process of this type is applied, the complicated chemical processes for the production of aluminum oxide and cryolite will be avoided and

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the electrochemical deposition of aluminum from melts prepared starting with aluminum oxide will become unnecessary. Calculations carried out by T. F. Antipin led to the conclusion that crystalline aluminum monohalides are capable of existing at room temperature. Antipin's results were confirmed in work done by F. Irrman (cf., Helvetica Chimica Acta, Vol 33, 1950, p 1449)

29. Mixed Chalcogenides of Thallium

"Mixed Chalcogenides of Thallium; Part 3," by S. S. Batsanov and I. Kh. Petrova, Institute of Inorganic Chemistry, Siberian Branch of the Academy of Sciences USSR; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR., No 7, Jul 60, pp 121-123.

Four compounds of trivalent thallium with mixed anions, namely Tl_2SSe_2, Tl_2STe_2, Tl_2SeS_2, and Tl_2SeTe_2, were synthesized for the first time. Their physical and chemical characteristics were determined.

30. The Constitutional Diagram of the Tantalum-Rhenium System

"The Constitutional Diagram of the Tantalum-Rhenium System" by M. A. Tylkina, L. A. Tsyganova, and Ye. M. Sabidskiy, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 8, Aug 60, pp 1905-1907

The constitutional diagram of the system tantalum-rhenium was constructed for the first time. The formation of two chemical compounds (Re_{22} Ta_7 and Ta_2 Re_3) was established. It was found that there is a large region of solid solutions on the tantalum side and a considerably lower solubility on the rhenium side.

31. The Constitutional Diagram of the System Vanadium-Rhenium

"The Constitutional Diagram of the System Vanadium-Rhenium," by M. A. Tylkina, K. B. Povarova, and Ye. M. Savitskiy, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 8, Aug 60, pp 1907-1910

The constitutional diagram of the system vanadium-rhenium was constructed for the first time on the basis of data obtained for that purpose by methods of physicochemical analysis.

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It was established that this diagram is of the peritectic type with two peritectics. Noteworthy is the very high solubility of rhenium in vanadium which is greater than the solubility of rhenium in any other transitional metal. It was found that in a region of solid solutions, the melting point of alloys increases from 1830° for pure vanadium to 2290° for alloys containing 32.5-43 atomic percent of rhenium.

32. High-Temperature Chlorination of Ilmenite Concentrate

"Investigation of the High-Temperature Chlorination of Ilmenite Concentrate," by A. B. Bezukladnikov, Berezniki Affiliate of the All-Union Aluminum-Magnesium Institute; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 6, Jun 60, pp 1240-1245

The equilibrium composition of the gas phase during the chlorination of titanium dioxide in the presence of solid carbon has been calculated. Chlorination of titanium dioxide at the temperatures of 2,173° and 2,273° K has been carried out. The isobar potentials have been calculated of reactions that may possibly take place during the chlorination of ilmenite concentrate with 100% chlorine in the presence of solid carbon, when the chlorination is carried at the temperatures of 1,573°, 1,773°, and 1,973° K. Chlorination of ilmenite concentrate was carried out in the temperature range of 1,773-2,373° K. It was established that under the conditions applied there is selective chlorination of iron in the first stage of the process accompanied by chlorination of titanium to the extent of 26-42%. The extent of chlorination of titanium is practically independent of the temperature in this stage. After 90% of the iron has been chlorinated, the extent of chlorination of titanium increases to 80%.

No information was available in the literature on the interaction of titanium dioxide or ilmenite concentrate with chlorine in the presence of carbon acting as a reducing agent at high temperatures. The thermodynamic aspects of chlorinations of this type had not been investigated. Data on the subject were obtained in the work described and are reported in this article.

33. The Electrolytic Production of Elemental Boron

"Concerning the Problem of the Electrolytic Production of Elemental Boron," by G. V. Samsonov, V. A. Obolonchik, and G. N. Kulichkina, Institute of Powder Metallurgy, Cermets and Special Alloys, Academy of Sciences Ukrainian SSR; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 6, Jun 60, pp 1365-1368

The possibility of producing boron under the conditions specified in USA patent 2572249 issued in 1949 to H. Cooper and W. Weil were investigated. It was established that electrolysis of a mixture of

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potassium chloride with potassium fluoroborate according to the procedure described in this patent does not yield elemental boron of a purity higher than 93%. To aid them in the development of procedures for the production of purer boron, the authors constructed and investigated the fusibility diagram of the system KCl-KBF_4. It was established that two eutectics are formed in this system. Experiments on the electrolysis of mixtures of KBF_4 with KCl at compositions close to that of the eutectics indicated that it is not possible to produce boron of a purity higher than 93% from these mixtures. However, the temperature at which electrolysis can be conducted is considerably reduced when eutectic mixtures are used (the electrolysis can be carried out at 600° instead of 800°). When pure KBF_4 not containing any KCl is electrolyzed, boron with a purity of 99% can be produced. However, the yield of boron is very small.

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Insecticides

34. Nitraphen - A New Insectofungicides and Herbicide

"Nitraphen - A New Insectofungicidal and Herbicidal Preparation", by A. I. Kulikov and I. P. Kurlina, Candidates of Chemical Sciences, I. M. Polyakov and N. A. Shipinov, Candidates of Agricultural Sciences, All-Union Institute of Plant Protection; Vestnik Sek'skokhozyaystvennoy Nauki, No 2, 1960, pp 123-124

Nitraphen, earlier known as preparation N125 in the experimental stage, has been developed by the All-Union Institute of Plant Protection together with All-Union Institute for the Treatment of shales as an effective insectofungicides and herbicide. It is a liquid consisting of the sodium salts of the products of alkylphenol nitration. It may be obtained from the phenols contained in shale and coal. An equally valuable preparation was obtained from the technical xylenols sent to the authors of the article from Czechoslovakia.

Nitraphen is recommended for combating diseases and pests of fruit trees and berry shrubs, destroying dodder (strangle weeds) on clover and alfalfa plantings and for eliminating foci of potato canker.

Nuclear Fuels and Reactor Construction Materials

35. Recrystallization of Cold-Rolled Uranium

"Recrystallization of Cold-Rolled Uranium" by G. Ya. Sergeyev, V. V. Titova, and L. I. Kolobneva; Moscow, Atomnaya Energiya, Vol 9, No 2, Aug 60, pp 104-109.

This article reports the results of an investigation of the effects produced on the structure and mechanical characteristics of uranium by rolling and annealing in the α- region. Cast uranium rolled in the γ - region and quenched in the β- region was used as the starting material. It was found that fine-grained recrystallized uranium has a much greater mechanical strength than the initial large-grained uranium. Approximate recrystallization diagrams have been constructed for degrees of reduction amounting to 5-40% and 10 hr annealing at 350-650°. It was established that the recrystallization is practically independent of the initial state of the material investigated. Data are given on the kinetics of recrystallization processes. It was found that addition of 0.1% by weight of molybdenum strongly inhibits recrystallization and increases the strength of finely-grained uranium by approximately 20%.

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36. The Interaction of Thorium Chloride With the Chlorides of Alkali Metals

"Physicochemical Investigation of the Interaction of Thorium Chloride With the Chlorides of Alkali Metals and Cerium in Melts" by V. I. Ionov, V. G. Korshunov, V. V. Kokorev, and I. S. Morozov, Chair of Chemistry and Technology of Rare and Dispersed Elements, Moscow Institute of Fine Chemical Technology; Ordzhonikidze, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Tsvetnaya Metallurgiya, Vol 3, No 3, May 60, pp 102-107

By applying the method of thermal analysis, the interactions of thorium chloride with the chlorides of sodium, potassium, cesium, and cerium were investigated. It was found that in the systems $ThCl_4$ - MeCl (with the exception of the case when Me = Na) the components form chemical compounds of the types $MeThCl_5$, Me_2ThCl_6, and Me_3ThCl_7. It was established that the compound $NaThCl_5$ melts incongruently at 370°, the compounds $KThCl_5$ and $CsThCl_5$ congruently at 428° and 490°, respectively; the compound Na_2ThCl_6 congruently at 360°; the compounds K_2ThCl_6 and Cs_2ThCl_6 incongruently at 406° and 573°, respectively; and the compounds K_3ThCl_7 and Cs_3ThCl_7 congruently at 705° and 720°, respectively. The data obtained by thermal analysis were confirmed by results obtained in the tensimetric investigation of the systems in question. It was established that the thermal stability of compounds formed by thorium chloride with the chlorides of alkali metals shows regular changes in the sense that it increases from sodium chloride to cesium chloride. By applying the method of thermal analysis, the fusibilities in the systems $ThCl_4$-$CeCl_3$ and $ThCl_4$-$CeCl_3$- NaCl were investigated.

Thorium chloride is one of the most important starting materials for the production of metallic thorium by procedures of metallothermic reduction or electrolysis of melts containing in addition to thorium tetrachloride the chlorides of lithium, sodium, potassium or magnesium. Chlorination of raw material containing rare earth elements in addition to thorium leads to the formation of thorium chloride.

37. The Heats of Formation of Potassium Compounds

"The Heats of Formation of Potassium Compounds," by P. G. Maslov, Chair of Physics, Leningrad Military Mechanics Institute; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 8, Aug 60, pp 1669-1675

Approximate general formulas are proposed for the determination of the heats of formation and in individual cases of other thermal characteristics of a large group of potassium compounds in the solid state

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and in some cases in solutions having a temperature of 25°. The precision of the results obtained by using these formulas amounts to 0.5- 1%. The characteristics in question have been determined for a very large number of individual potassium compounds, specifically, many coordination compounds, hydrates of double salts, and some other compounds, including 2 KCl. $UO_2 Cl_2 . nH_2O$ and KCl. $ThCl_4 . nH_2O$.

38. Coprecipitation of Tetravalent Plutonium With Lanthanum Oxalate

"Investigation of the Coprecipitation of Pu (IV) With Lanthanum Oxalate," by V. I. Grebenshchikova and R. V. Bryzgalova; Leningrad, Radiokhimiya, No 5, May 60, pp 265-273

It was established that plutonium coprecipitates with lanthanum oxalate with the formation of anomalous mixed crystals which do not exhibit a lower limit of miscibility in the concentration range of the microcomponent from 10^{-9} to 10^{-6} M. The distribution of Pu (IV) between the lanthanum oxalate and the solution may take place according to Khlopin's law or the logarithmic law depending on the conditions under which the coprecipitation is carried out. In nitric acid solutions (with a concentration of 1.5 or 0.5 N) which have a content of oxalic acid or ammonium oxalate not exceeding 0.1 M, there is significant enrichment of the lanthanum oxalate crystals with plutonium (D = 21). An increase of the concentration of oxalate ions in the solution brings about gradual reduction of the coefficient of crystallization by reason of the formation of complex ions by Pu (IV) and oxalate ions present in the solution. Thus, Pu (IV) behaves similarly to trivalent elements as far as its coprecipitation with a trivalent carrier is concerned. The only difference is a sharp decrease of the coefficient of crystallization when the concentration of oxalate ions in the solution is changed. This is due to the fact that Pu (IV) has a greater capacity to form complexes.

39. The Carry-Over of Radioactive Substances With the Steam and Water of Boiling Water Reactors

"Investigation of the Transfer of Radioactive Material with Water and Steam and of the Chemical Stability of Deposits in a Water-Steam Loop of the First Soviet Nuclear Power Station," by P. N. Slyusarev, G. N Ushakov, O. V. Starkov, L. A. Kochetkov, L. N. Nesterov, and V. Ya. Kozlov; Moscow, Atomnaya Energiya, Vol 9, No 2, Aug 60, pp 98-103.

Important problems in connection with the operation and design of boiling water reactors or reactors used to boil water and superheat steam for power generation are: radioactive contamination of the steam which is generated and conducted into the turbine; the stability of deposits

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consisting of radioactive substances; and the deactivation of the inner surfaces of the conduits and of the turbine which are covered with radioactive deposits. Processes of the transfer of radioactive substances with steam and water were investigated in a loop built into the first cycle of the power station. The coefficient of the deposition of substances on the inner surface of conduits was investigated and the chemical stability of the deposits studied. Problems pertaining to the deactivation of some parts of the equipment used to generate power by steam were subjected to investigation. Dilute solution of nitric and hydrochloric acids with and without urotropin acting as an inhibitor were applied for the deactivation of 1Kh18N9T steel surfaces on which radioactive substances containing Co^{60}, Fe^{59}, Ca^{45}, and Cr^{51} were deposited.

40. Separation of Stable Boron Isotopes

"Separation of Stable Boron Isotopes" by N. N. Sevryugina, O. V. Uvarov, and N. M. Zhavoronkov; Moscow, Atomnaya Energiya, Vol 9, No 2, Aug 60, pp 110-125.

Methods for the separation of stable boron isotopes are described. It is pointed out that three of them can be used in the production of B^{10} concentrates on an industrial scale. While the method of chemical exchange is distinguished by a large separation factor (α = 1.03), the efficiency of installations employing this method is low because of the high molecular weight of the complexes that have to be used. The complex compound best suited for chemical exchange is that formed by BF_3 with anisole; by using this compound, one can separate boron isotopes at atmospheric pressure. Production of B^{10} by the distillation of BF_3 is of advantage because of the relatively high separation factor (α = 1.0075); however, the process must be carried out at minus 100°C, so that large quantities of liquid air are required. Distillation of BF_3 was originally used in the USSR for the production of relatively large quantities of B^{10}. Procedures developed for this separation process are described. The separation factor attained in the distillation of BCl_3 is low (α = 1.003). Nevertheless, separation by the distillation of BCl_3 is of advantage because the process can be carried out at atmospheric pressure and room temperature.

Although separation of an inert substance by diffusion in a stream of vapor is not included among the most efficient methods for application on a large scale that are mentioned above, this method of separation is described in some detail. It is stated that considerable advances in the development of this method have been made in the USSR and GDR, where installations with a high separation capacity were designed. By using installations with a cascade consisting of 70-80 metal and glass pumps, almost pure $B^{10}F_3$ and $B^{11}F_3$ can be obtained. The separation factor of

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a diffusion pump amounts to 1.016 for a BF_3 - BF_3 mixture. However, because large amounts of power are required for the evaporation of the inert substance, this method is recommended only for the preparation of a highly enriched product on a laboratory scale. When installations of this type are used it is advisable to carry out preliminary enrichment in equipment requiring less power.

41. A Book On the Chemistry and Technology of Lithium Published By Atomizdat

Litiy, Yego Khimiya i Tekhnologiya (Lithium, Its Chemistry and Technology) by Yu. I. Ostroushko, P. I. Buchikhin, V. V. Alekseyeva, T. F. Naboyshchikova, G. A. Kovda, S. A. Shelkova, R. N. Alekseyeva, and M. A. Makovetskaya; Moscow, Atomnaya Energiya, Vol 9, No 2, Aug 60, p 160

The first chapter of this 199 pp book published by Atomizdat, Moscow, in 1960, deals with the geochemistry and mineralogy of lithium; the second and third chapters are concerned with the chemistry of lithium and its compounds and the analytical chemistry of lithium; the fourth and fifth chapters discuss methods for the enrichment and conversion of lithium ores; and the sixth, the final chapter, is concerned with problems of the metallurgy of lithium. At the end of every chapter references are listed. Taken together, these references form a bibliography on the subject covering the period from 1818 to 1958.

This book serves the needs of scientific workers, metallurgical engineers, and chemists working in the field of the chemistry and technology of rare and disposed elements; engineers and technical men employed in lithium production; and students at higher educational institutions and technical schools.

42. Isolation of Rare Earths from Minerals

"Isolation of Rare Earths from Minerals," by F. V. Zaykovsky and V. S. Bashmakova; Moscow, Zhurnal Analiticheskoy Khimii, Vol XV, No 2, 60, pp 166-169

It is shown that cerium and yttrium rare earth oxalates, when crystallized with calcium oxalate as a precipitator, can be isolated only by double precipitation. Sodium p -aminosalicylate is proposed for the separation of thorium from rare earths. A method for isolating rare earths from minerals has been developed.

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43. Determination of Uranium by a Luminescence Method

"Analytical Chemistry of Uranium. Part 1 - On the Determination of Uranium by a Luminescence Method" by V. F. Grigor'yev, V. K. Lukyanov and Ye. P. Duderova; Moscow, Zhurnal Analiticheskoy Khimii, Vol XV, No 2 1960, pp 184-190

An electric furnace with a platinum cartridge is proposed for preparing luminescent samples with high accuracy. The mean reproducibility of the luminescence of the disks made of a fluoride-carbonate mixture and a pure solution of the uranyl salt is ± 2%.

A tube with a piston is proposed for proportioning the flux powder. The mean accuracy of proportioning is ± 1%.

An improved modified rapid method of preparing beads is proposed. The mean reproducibility of the luminescence of beads made of sodium fluoride and a pure solution of the uranyl salt is 6-7%.

The design of a photoelectric instrument for measuring the intensity of the luminescence of disks, beads and powders has been developed. A deflection of the pointer in the range of maximum sensitivity over the whole scale of 150 mm corresponds to a concentration of uranium in the disk equal to 0.08 γ/g. The readings on samples with uniformly distributed uranium are reproducible within the limits of ± 1.5%.

Methods for determining uranium without the preliminary purification have been tested on standard ores.

44. On the Determination of Tritium

"On the Determination of Tritium," by G. N. Trusov and N. A. Aladzhalova; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 2, 1960, pp 238-239

A method has been worked out for the analysis of water for its tritium content without converting the water into gas. The analysis is carried out with the use of SBM-7 internally filled counters containing isopentane.

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45. Photometric Determination of Thorium in Monazites With the Arsenazo II Reagent

"Photometric Determination of Thorium in Monazites With the Arsenazo II Reagent," by V. I. Kuznetsov and S. B. Savvin, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR; Moscow, Zhurnal Analiticheskoy Khimii, Vol XV, No 2, 1960, pp 175-179

A method is described for the photometric determination of thorium in monazites with the arsenazo II reagent directly after the decomposition of monazite without separating thorium from the impurities.

No interference is caused by phosphates (up to 30% P_2O_5), Zr, Ti, Mo, V, W (up to 0.2-0.5%), rare earths, and other elements. The time for a determination is 25-30 min. The error is not more than 3-5% relative.

46. Rapid Method for the Spectrographic Analysis of Mixtures of Rare-Earth Elements

"Rapid Methods for Spectrographic Analysis of Rare Elements: Part 1 - Analysis of Complex Mixtures of Rare Earths," by V. A. Korneyev; Moscow, Zhurnal Analiticheskoy Khimii, Vol XV, No 2, 1960, pp 170-174

A rapid method for complete analysis of complex mixtures of rare earths is based on the use of homologous pairs in combination with stepwise weakening of the spectrum. This method, which is described, permits a simultaneous determination of all the individual rare earths in the range of concentrations (0.1-2) - 100%, with an accuracy of +- 10-20% (relative). The method is 8-10 times more rapid than other spectographic methods.

47. On the Zr/Hf Ratio in Zircons of Some Igneous Rocks of the Northern Slope of the Kuramin Mountain Range

"On the Zr/Hf Ratio in Zircons of Some Igneous Rocks of the Northern Slope of the Kuramin Mountain Range" by A. V. Kosterin, I. D. Shevaleevski, and E. K. Rybalova, Far Eastern Branch of the Academy of Sciences USSR; Moscow, Geokhimiya, No 5, Jul 60, pp 451-454

Forty nine zircons of igneous rocks from the northern slope of the Kuramin mountain range were analyzed with the aid of the X-ray spectrum method.

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It is shown that the Zr/Hf ratio is determined, not only by the rock composition, but also by the conditions of formation.

Organic Chemistry

48. Chemistry of Borazole

"Borazole and Its Derivatives," by B. M. Mikhaylov, Institute of Organic Chemistry, Academy of Sciences USSR, Moscow, Uspekhi Khimii, Vol 29, No 8, Aug 60, pp 972-992

Advances in the chemistry of borazole are reviewed under the general subject headings of methods for the synthesis of borazole and its derivatives, syntheses based on transformations of functional derivatives of borazole, and properties of borazole and its derivatives. A section on syntheses of borazole derivatives from boron trichloride and amines is included. It is pointed out that because of the relative stability of the borazole ring to hydrolysis, borazole derivatives (hydroxyderivatives, aminoderivatives, and especially compounds that contain unsaturated hydrocarbon groups) may be used for the synthesis of boron-containing polymers that are resistant to the action of oils and exhibit a heightened thermal stability. It is also stated that borazole derivatives are of interest as rocket fuels.

The review is based mainly on non-USSR publications (58 references out of a total of 71 listed in the bibliography are to non-USSR publications). So far as USSR work is concerned, results of investigations by B. M. Mikhaylov and members of his group on methods for the synthesis of borazole and its derivatives are reviewed in some detail (nine references). An article by A. F. Zhigach and others is mentioned, in which the preparation of B-triethylborazole by heating triethylboron ammoniate in an autoclave at 450° is reported. It is stated that an 80% yield of B-triethylborazole was obtained. Older reviews by Zhigach (Uspekhi Khimii, Vol 25, 1956, p 1267) and B. M. Mikhaylov (Uspekhi Khimii, Vol 28, 1959, p 1450) of progress in the chemistry of boron compounds are listed.

49. New Type of Polymers Derived From Borazole

"Copolymerization With Hexamethylenediisocyanates of Borazoles Substituted at the Boron Atoms," by V. V. Korshak, V. A. Zamyatina, N. I. Bekasova, and Ma Shui-jan; Moscow, Vysokomolekulyarnyye Soyedineniya, Vol 2, No 8, Aug 60, p 1287

By reacting with hexamethylenediisocyanate borazoles substituted at the boron atoms, polymers were synthesized which contain borazole in the chain. The polymers which were obtained are transparent vitreous sustances with a yellow coloration. Depending on the nature of the substituent at the boron atoms, these polymers have different softening points.

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50. Some Properties of Dimethylamineboron Fluoride

"Kinetics of the Hydrolysis of Dimethylamineboron Fluoride," by I. G. Ryss and S. L. Idel's, Dnepropetrovsk Institute of Railroad Transportation Engineers; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 8, Aug 60, pp 1756-1760

A method for the synthesis of $F_3B{:}NH\ (CH_3)_2$ from boron trifluoride and dimethylamine is described. Some properties of the addition compound, particularly its behavior with respect to hydrolysis, have been investigated and are described. The kinetics of the hydrolysis of the addition compound were investigated in detail. The mechanism of the action of OH^- and F^- in the hydrolysis reaction was investigated. It was found to be analagous to that observed in the cases of the hydrolysis of compounds formed by BF_3 with ammonia and monomethylamine.

51. Synthesis, Properties, and Kinetics of the Hydrolysis of Trimethylamineboron Fluoride

"Kinetics of the Hydrolysis of Trimethylamineboron Fluoride," by I. G. Ryss and S. L. Idel's, Dnepropetrovsk Transportation Institute [Dnepropetrovsk Institute of Railroad Transportation Engineers]; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 8, Aug 60, pp 1761-1767

A method for the synthesis of pure trimethylamineboron fluoride is described. The kinetics of the hydrolysis of $F_3B{:}\ N\ (CH_3)_3$ were investigated in detail. The results of the investigation are reported. On the basis of a hypothesis advanced earlier by I. G. Ryss (cf. Doklady Akademii Nauk SSSR, Vol 120, 1958, p 797), it was expected that the rate of hydrolysis of trimethylamineboron fluoride would prove low and would be independent of the alkalinity of the solution. The experimental results confirmed this assumption. The regular increase in the energy of activation of the hydrolysis of BF_3 with the increase of the basic properties of the amine added to this compound is explained.

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52. Tautomeric Equilibrium of Thioacids of Phosphorus in Benzene and Chlorobenzene

"Study of Tautomerism in Aproton Media. Tautomeric Equilibrium of Thioacids of Phosphorus in Benzene and Chlorobenzene," by M. I. Kabachnik, S. T. Ioffe, and T. A. Mastryukova, Institute of Organo-Elemental Compounds, Academy of Sciences USSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 8, Aug 60, pp 2763-2767

The authors measured the protolytic constants of a number of oxygen, dithio- and monothiophosphoric acids with a hexamethoxy-red indicator in benzene and chlorobenzene by the colorimetric method. The tautomeric equilibrium of thioacids of phosphorus in benzene and chlorobenzene was practically completely displaced in the direction of the thiono forms. This was established by the use of a method based on the Brensted-Izmaylov theory and by comparison with indexes of the constants of protolysis with $\Sigma\sigma$.

53. Investigation of the Reactions Between Esters of Alkylphosphinic Acids and Halogen-Containing Compounds

"Reactions of Esters of Alkylphosphinic Acids With Halogen-Containing Compounds," by A. N. Pudovik, A. A. Muratova, T. I. Konnova, T. Feoktistova, and L. N. Levkova, Kazan State University; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 8, Aug 60, pp 2624-2630

The authors established that upon heating the esters of alkylphosphinic acids with alkyl halides in which the radical is heavier in comparison with those present in the ester group, realkylation occurs. The alkyl iodines enter into reaction more readily than alkyl bromides; and the latter, more readily than alkyl chlorides. The heavier the radicals in the ester groups of the alkylphosphinic acids, the slower the process of realkylation proceeds.

The esters of alkylphosphinic acids react with methylene iodide to form the esters of methylene-di(alkoxylalkylphosphinic acids) and with the ethyl ester of bromoacetic acid to form the alkylcarboxyethylmethyl and dicarboxyethylmethyl esters of alkylphosphinic acids.

The dialkylesters of dialkylpyrophosphinic acid are formed as a result of the reaction between esters of alkylphosphinic acids with the acid halides of acids.

The authors made an assumption on the mechanism of the reactions studied and noted the necessity of taking them into consideration in conducting the Arbuzov Rearrangement reaction.

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54. Study of the Clausen Rearrangement of Allyl Esters of Thiophosphoric Acid

"The Clausen Rearrangement of Allyl Esters of Thiophosphoric Acid," by A. N. Pudovik and I. M. Aladzheva, Kazan State University; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 8, Aug 60, pp 2617-2624

The authors synthesized a number of allyl- and crotylthio-phosphric acids. They found that O,O-dialkylesters of O-(α-methyl-allyl)-and O-(γ-methylallyl)-thiophosphoric acid, upon heating, undergo the Clausen rearrangement into the corresponding O,O,S-thiophosphoric esters. The rearrangement of esters of O,O-dialkyl-O-(α-methylallyl)- and O,O-dialkyl-O-(γ-methylallyl)-thiophosphoric acids occurs with inversion.

One table accompanies the article showing the physical characteristics of the synthesized unsaturated O,O-dialkyl-O-allyl- and O,O-dialkyl-s-allylthiophosphoric esters.

55. Study of Isoprene Oxide Reactions.

"Reaction of Isoprene Oxide With Hydrogen Sulfide, Mercaptanes, and Ketones," by A. N. Pudovik and T. M. Orlova, Kazan State University; Moscow, Zhurnal Obshchey Khimii Vol 30, No 8, Aug 60, pp 2614-2617

The addition of hydrogen sulfide to isoprene oxide occurs in accordance with Markovnikov's law. Upon the addition of ethyl- and propylmercaptanes to isoprene oxide in the presence of sodium mercaptide, approximately 1.5 times more of the primary thioesters are formed than the tertiary; in the presence of the trifluoroboron esterate, 3 times more of the tertiary thioesters is formed than the primary.

The corresponding cyclic acetals-dioxolanes were formed with a yield of 40-50% from isoprene oxide and Ketones in trifluoroboron esterate. The authors add that their interest in dioxolanes has increased since they can be used as plasticizers, solvents, and pharmaceutical preparations.

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Physical Chemistry

56. Classification of Separation Processes

"Classification of Separation Processes," by L. A. Nisel'son, Moscow, Institute of Nonferrous Metals and Gold imeni M. I. Kalinin; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 7, 1960, pp 1460-1469

An attempt has been made to classify complex separation processes on the basis of differences in the mass flow dynamics of the components being separated. It has been shown that at the basis of multistage separation processes, countercurrent, zonal, and chromatographic, may be laid any elementary process of separation, provided it belongs to the type termed in the investigation as "dynamically reversible."

A relation has been established between the three fundamental types of column processes, counterflow, zonal, and chromatographic, and the possibility has been shown of gradual transition from one to the other. Starting from the classification, new processes heretofore not used may be developed.

Radiation Chemistry

57. Interaction of Sulfur and Natural Rubber by the Action of Ionizing Radiation

"Interaction of Sulfur and Natural Rubber by the Action of Ionizing Radiation," by Z. N. Tarasova, M. Ya. Kaplunov, V. T. Kozlov, N. A. Klauzen, and B. A. Dogadkin, Scientific Research Institute of the Tire Industry; Moscow, Vysokomolekulyarnyye Soyedineniya, No 8, Aug 60, pp 1201-1206

The effect of sulfur on the kinetics of the radiation structurization of natural rubber and the properties of the radiation vulcanizates have been investigated. At 25°, a marked addition of sulfur under the action of the radiation is observed, the amount increasing with increasing doses in conformity with a curvilinear relationship. The rate of addition increases with the temperature. The presence of sulfur diminishes the effect of structurization. Increase in temperature during the irradiation from minus 80 to plus 100° causes an intensification in the structurization. With pure rubber at temperatures above 50°, reversion of the structurization process takes place; in the presence of sulfur, this phenomenon is not observed. On irradiating natural rubber and its mixtures with sulfur in argon, a significant fall in unsaturation is observed, the fall being less marked in the presence of sulfur.

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Investigation of the problems involved is of importance from the standpoint of the development of radiation-resistant rubber and also for establishing conditions under which combined vulcanization by applying radiation and using sulfur can be carried out. The results obtained in work of this type may lead to procedures for the modification of radiation-vulcanized rubber.

58. Glass That Protects Against Solar Radiation

"Magic Glass" (unsigned item); Moscow, Nedelya (Sunday supplement to Izvestiya), No 29, 17 Sep 60, p 23.

"The technology of a novel glass with unusual characteristics has been developed in the GDR. Glass of this type has never been used before. Under the action of strong sunlight, this glass assumes a milky white appearance and becomes completely opaque. When the intensity of the solar light diminishes, the glass reverts to its original state -- it becomes fully transparent again. The new glass protecting against solar radiation will be used as a material for roofs and walls, as well as in light shafts and at industrial plants."

CPYRGHT

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III. ELECTRONICS

Communications

59. Characteristics of Systems with Fading Discussed

"Some Properties of Communication Systems With Fading," by E. L. Blokh and A. A. Kharkevich; Moscow, Radiotekhnika, Vol 15, No 9, Sep 60, pp 3-9

The article examines questions associated with communication systems having a multiplicative type of noise such as fading. General equations are derived for the carrying capacity of communications systems for three cases -- additive noise, damping in FM and PM systems, and damping in AM systems, and the systems are compared. Examples of corrective codes are given for all three cases.

60. Formulas Derived for Engineering Calculation of Linear Conductors

"Engineering Calculation of Resistances of Linear Conductors With Consideration of the Effect of Real Ground Conditions," by A. S. Knyazev; Moscow, Radiotekhnika, Vol 15, No 9, Sep 60, pp 21-32

A method of induced emf is used for the engineering calculation of linear conductors placed over ground having real electrical properties. The length of the conductor is taken as arbitrary. Formulas are derived which may be used to compute the resistance of a number of simple radiating systems.

An experimental check provides data which agree favorably with calculations. The comparatively minor influence of changes in the parameters of the ground on the internal resistance of a vertical half-wave dipole is verified. For a horizontal dipole, complete agreement between experimental and computed data is achieved only for an antenna height $h > 0.05 \lambda$. In the opinion of the author, the comparison indicates that the calculated formulas are acceptable for engineering practice.

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61. Optimum Passband for Improved FM Receiver Established

"Optimum Filter Passband in an FM Receiver With Automatic Tuning," by Ya. G. Rodionov; Moscow, Radiotekhnika, Vol 15, No 9, Sep 60, pp 47-53

The described method of FM reception with automatic tuning, which, according to the author, was theoretically developed by D. V. Ageyev in 1952-1954, consists in making the passband of one of the IF or high frequency filters of the receiver narrower than in ordinary systems. Its resonant frequency changes in accordance with the instantaneous value of the frequency of the resulting voltage in the filter, which depends basically on the useful signal. If almost distortionless control of the resonant frequency of the filter is maintained and this control is weakened for noises having a wider frequency spectrum, the system will provide increased noise-stability.

The noise-stability and optimum value for the filter passband of such a system are determined. For high noise-stability and low distortion, this value was found to equal 2 - 2.5 F_{max}, where F_{max} is the maximum modulation frequency.

62. Recent Soviet Patents in the Field of Communications

"Authorship Certificates," unsigned article; Moscow, Elektrosvyaz', No 9, Sep 60, p 74

Class 21c, 3_{12}. No 124490. N. N. Solov'yev. Device for Determining a Damaged Section of Underwater Cable.

Class 21c, 46_{05}. No 124972. M. A. Vul'fson, V. G. Zusman, D. R. Kritskiy and V. V. Bitt. Reading Device.

Class $21d^2$, 12_{03}. No 124520. K. I. Vil'pert. Transistorized Inverter of DC Current into AC Current.

Class $21d^2$, 12_{04}. No 124521. S. A. Levitan and I. B. Negnevitskiy. Magnetic Modulator.

Class $21d^2$, 14_{01}. No 124522. I. G. Gol'dreyer, Converter of DC Signals Into AC Signals.

Class 21e, 11_{20}. No 124985. P. S. Boguslavskiy. Device for Analysis of AC Voltage Harmonics.

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Class 21c, 30_{10}. No 124534. V. A. Baramidze and I. G. Gol'dreyer Direct-Coupled Wide-Band Amplifier.

Class 21c, 36_{01}. No 124540. Yu. A. Skripnik. Device for Measuring the Amplitude Ratio of Two AC Voltages.

Class 21c, 37. No 124544. A. A. Akopyan. Voltage Pulse Generators.

Class 21g, 13_{21}. No 123262. Yu. N. Prozorovskiy. Device for Scanning an Electron Beam.

Class 21g, 13_{26}. No 123263. G. V. Braude. Cathode-Ray Storage Tube.

Class 21g, 29_{20}. No 124561. G. S. Vil'dgrube. Photoelectron Multiplier.

Components

63. Effect of Irradiation on the Performance of Capacitors

"Changes in Capacitance of Air Capacitors Under Irradiation," by V. P. Sokolov; Moscow, Atomnaya Energiya, Vol 9, No 2, Aug 60, pp 142-143

In conjunction with recent studies of the effect of nuclear radiation on the performance of electronic equipment, it becomes expedient to examine the problem of capacitance changes in electric capacitors when subjected to irradiation. The change in the capacitance of such air capacitors is attributed to the formation of ions in the space between the plates, which is equivalent to a change in the dielectric constant of the air.

The capacitance of the air capacitors increases gradually with increase of the radiation intensity to a certain maximum value which depends on temperature, air pressure and the nature of the irradiation. It was observed that at higher frequencies the effect of irradiation on the capacitance sharply decreases.

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64. Tunable Ferrite Filters Designed for Spectral Measurements

"Ferrite Filters With Variable Tuning," by B. M. Beskorovaynyy, V. M. Vol'f, V. S. Gorbenko, M. I. Karnovskiy, B. I. Shotskiy and A. A. Yur'yev; Moscow, Radiotekhnika, Vol 15, No 9, Sep 1960, pp 57-63

The use of ferromagnetics with high permeability has made it possible to design iterative filters with variable tuning, the inductance of which may be changed by 20-25 times by changing the bias current. Analyzers and spectrometers based on ferrite filters and operating in the audio frequency range were developed by the Chair of Acoustics and Audio Engineering of the Kiev Polytechnic Institute in 1958.

An analyzer is described which operates in a frequency range of 40 cycles to 15 kilocycles. Dimensions of the instrument are 230x300x350 mm, and its weight is 21 kg. In addition, experimental verification was made of the possibility of designing an analyzer with a range of 40 cycles to 120 kilocycles having characteristics similar to the one described above.

65. Semiconductor Refrigerators

"Experimental Investigation of a Semiconductor Water Cooler," by V. Martynovskiy and V. Nayer, Odessa Technological Institute for Food and Refrigeration Industry; Moscow, Kholodil'naya Tekhnika, No 4, Jun-Aug 60, pp 13-16

The power consumption efficiency of a semiconductor material used in refrigeration units is characterized by a certain factor, the value of which approaches $3.10^{-3}\frac{1}{K^o}$ for the best materials known at present.

The experimental water-cooling installation consisted of a flat, U-shape tube with an effective length of 1,100 mm with 20 semiconductor elements mounted on it. The flat side of each element was welded to two semiconductors, one positive and the other negative. All of the thermoelements were connected in series. The electrical contact was established through the ribs at the hot junction and through the tube elements at the cold junction. The semiconductor materials were secured from the Institute of Semiconductors, Academy of Sciences USSR. The electric power was drawn either from a rectifier or a battery.

The dependence of cooling coefficient on the magnitude of current supplied were studied for this unit. The inlet water was cooled about 15°C.

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The author states that on the basis of experimental data, it can be concluded that the efficiency of such a semiconductor cooler approaches that of a conventional compressor unit. The absence of moving parts and simplicity of design are other factors which will promote wider use of semiconductor coolers in the future.

Instruments and Equipment

66. Instrument for Measuring Antenna Impedance

"Instrument for Measuring Input Impedance of Long- and Short-Wave Radio Broadcasting Antennas," by V. A. Khatskelevich and L. N. Yakovlev; Moscow, Vestnik Svyazi, No 6, Jun 60, pp 12-14

The article describes wiring and construction of an instrument which can measure the real and reactive components of input inpedance of an antenna-feeder assembly operating in the wave-length range of 200 to 2,000 m. The method of measurement is described in brief. This instrument can also measure the impedance and resistance of coils and capacitors in the indicated wave-length range.

The article contains the following passage:

> "At the present time the industry does not serially manufacture instruments for measuring the input impedance of antenna-feeder systems. Therefore, the described instrument is of practical interest."

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67. Voltage Stabilizer With Wide Control Range Described

"Electronic Voltage Stabilizer for Supplying Transistorized Circuits," by G. N. Muskhelishvili and G. V. Zakomorniy; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 60, pp 139-141

> "An electronic voltage stabilizer for supplying low-voltage circuits is described. Output voltage may be controlled from fractions of a volt to tens and hundreds of volts at a current of up to 1.0a. Instability of the output voltage is no worse than ± 0.1%. Internal resistance of the source is not greater than 0.05 ohm. Under full load, fluctuations in the output voltage do not exceed 2 mv."

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The stabilizer was developed by the authors at the Institute of Electronics, Automatics and Telemechanics of the Academy of Sciences Georgian SSR.

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68. Large Resistances Measured with Hydrogen Thyratron Circuit

"Pulse Method for Measuring Large Resistances," by G. M. Zakharov, T. I. Nikitinskaya, and A. G. Khapachev; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 60, pp 82-84

Present pulse techniques have made it possible to develop comparatively simple circuits for measuring large resistances which are free of faults such as polarization effects, capacity currents, and heating, usually associated with mechanical or tube-type electrometers.

One variation of a hydrogen thyratron pulse circuit was developed by the authors at the Leningrad Polytechnic Institute to provide square pulses with amplitudes of up to several kv. A description of the circuit, containing a type TGII-90/8 thyratron and pulse shaping line, and the principle of operation are given. The maximum value of measured resistance possible for the circuit described was 10^{10} ohms.

69. Precision Measurement of Semiconductor Thermoelectromotive Force

"On the Method of Fast Precision Measurement of Thermo-emf in Semiconductors," by O. V. Yemel'yanenko and F. P. Kesamanly, Physicotechnical Institute, Academy of Sciences USSR (Leningrad); Moscow, Fizika Tverdogo Tela, No 7, Jun 60, pp 1494-1496

Contact-type thermocouples can be used for fast measurement of the surface temperature of a semiconductor by measuring the thermo-emf resulting from the temperature gradient. The accuracy of measurement of the contact-type thermocouple depends on how close the temperature of the thermocouple junction is to that of the sample. To prevent thermal flow through the contact of the measuring thermocouple to the sample, controlled heating of the thermocouple is employed. One of the thermocouples touches the surface of the sample, while the other is separated by a small gap. The temperature of the sample is determined by the current indications of the thermocouple in contact with the sample, while the heating is controlled by the second junction.

The diameter of the thermocouple junction was only about 0.5 mm, and the actual linear contact with the sample was only about 0.03 mm. The device requires about 10 min to make a single measurement of semiconductor thermo-emf, and about 3 hrs to measure the changes in thermo-emf for a temperature range from 25° to 150°C (about 15 points).

The effect of impurities on the thermo-emf of gallium arsenide were studied with the aid of this instrument.

The author thanks professor D. N. Nasledov for assistance.

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70. Measurement of Pulse Repetition Rate with High Spacing Factor

"Measurement of Pulse Repetition Rate With High Pulse Spacing Factor Using Standard Pulse Rate Meters," by V. N. Kuz'michev and V. F. Nesteruk, Leningrad Ship Building Institute; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, Vol 3, No 4, 1960, pp 106-107

The presently used pulse frequency meters, the ICh-5 and ICh-6, are based on measurement of the mean value of rectified current of a capacitor which is repeatedly charged with the measured pulse within a certain limit of potential difference. However, such instruments are not capable of measuring the pulse rate when the pulse spacing factor is high.

Both the ICh-5 and ICh-6 designed for a voltage wave form such that the ratio of duration of the positive period to that of the negative period does not exceed 3 or is smaller than one third.

The article explains how the ICh-5 and ICh-6 instruments can be adapted, by incorporating a trigger unit with a 6NIP tube, to measure pulse rate with a much greater pulse spacing factor. Tests were carried out for the following parameters of the input voltage: the shortest pulse duration was 0.3 microsec, the highest value of pulse spacing factor was 3.10^7, the highest pulse repetition rate was 400 kv, the amplitude of the input signal varied from 0.5 to 150 v.

The reliability and accuracy of the ICh-6 instrument with the trigger adapter was shown to be satisfactory for a wide range of measurements.

71. Secondary-Electron Multiplier Developed

"On the Use of Continuous Secondary-Electron Multiplication for Ampliyfing Small Currents," by P. K. Oshchepkov, B. N. Skvortsov, B. A. Osanov, and I. V. Siprikov; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 89-91

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"A description is given of an electron multiplier which operates on the principle of continuous secondary-electron amplification without a focusing electrode. Fundamental considerations which form the basis for an approximate calculation of the multiplying system are given, and general requirements which must be satisfied by the material used as the secondary-electron emitter are formulated." The article describes the technology of preparation and composition of one variation of emitter material -- a mixture of TiO_2 and MgO. Secondary-emission and time

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characteristics of the emitter are given. The article states that "at the present time a model of an electrometric stage with a continuous secondary-electron multiplier has been prepared for testing under laboratory conditions." Work was conducted in the electrophysics laboratory of the Institute of Metallurgy of the Academy of Sciences USSR.

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72. New Apparatus for Accurate Measurement of Vibrations

"Small Vibration-Measuring Apparatus," unsigned; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, p 149

A new vibration measuring device designed to convert vibration parameters to electrical currents is described. Basic components are a four-stage amplifier, carrier frequency generator (2,000 cycles), and a rectifier. In principle, the apparatus converts changes in the inductive reactances of the arms of an accelerometric pickup to modulations in the carrier frequency.

Nonlinearity of amplitude characteristics in all four channels of the apparatus does not exceed ± 1%. Maximum output current is 1.5 amps for recording with an oscillograph.

73. Hall-Effect Frequency Divider

"Application of Hall Effect to Frequency Division," by V. S. Andreyev, M. Ye. Mazurov and I. N. Prudnikov; Moscow, Elektrosvyaz', No 9, Sep 60, pp 12-19

The results of experimental investigation for several configurations of regenerative frequency dividers utilizing linear transducers based on the Hall effect in semiconductors are described in this article. The Hall-effect emf transducers were made of n-germanium, InSb, and InAs, and were fabricated in the form of thin plates. A series of tests were carried out with the n-germanium to determine the dependence of the Hall-effect emf on the current passing through the transducer. These measurements were taken with dc current and for various inductions of dc magnetic field to prove the linear dependence of Hall-effect emf on both the current passing through the transducer and the magnitude of induction of the magnetic field.

The advantage of the Hall-effect transducer as a frequency divider is its wide range of operating frequencies, i.e., from zero to several tens of megacycles. The Hall-effect emf transducer behaves in the circuit as a linear element, because the amplitude of the effective emf for a constant amplitude of the signal is proportional to the feedback voltage.

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Several circuits were designed incorporating Hall-effect transducers, able to divide frequency by any factor in the range from 2 to 50. All these circuits for various factors of frequency division operated in a stable manner even with certain fluctuations of the supply voltage.

74. New Electron Microscope

"All Purpose Electron Microscope of High Resolving Power UEMV-100," by P. A. Stoyanov, G. A. Mikhaylovskiy, A. R. Bertyn', N. M. Grishina, and V. V. Mosevey; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 60, pp 110-117

A new electron microscope UEMV-100 is described. Its characteristics are comparable with those of the UEMB-100 microscope, produced by industry. The new electron microscope has a rating of 10 Å, has a focusing corrector, a deflection system for work on reflection, a binocular magnifier, a new vacuum system and other improvements, facilitating the work of the operator and the obtaining of high resolutions.

Materials

75. Method Proposed for Improving Contacts of Photoresistors

"Cadmium Sulfide Photoresistors FSK-M1 With Improved Contacts," by G. I. Golynnaya, G. A. Fedorus, and M. K. Sheynkman; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 1960, pp 141-143

A new, more effective method for improving the ohmic contact between a metal and cadmium sulfide-type semiconductors was developed by the authors at the Institute of Physics of the Academy of Sciences of Ukrainian SSR. The method involves treating the surface of the crystal (single crystals of CdS, CdSe and CdS-CdSe) in a glow discharge before applying the metal (alumimum). The charge is created in a vacuum between two aluminum discs, with the crystal placed on the lower disc in electrical contact with it. After treating the crystal for several minutes the vacuum is increased and aluminum electrodes are applied to the crystal surface by vaporization.

Studies showed that these contacts provide linear volt-ampere characteristics in a temperature range of -190 to +100°C, a low level of contact noise and good stability.

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76. A Method for the Production of Semiconductor Arsenic

"A Method for the Preparation of Arsenic of High Purity," by N. A. Goryunova, L. V. Kradinova, V. I. Sokolova, and Ye. V. Sokolova, Leningrad, Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 6, Jun 60, pp 1402-1410

A method for the preparation of very pure arsenic which would be suitable for the synthesis of gallium arsenide of semiconductor quality is described. To prepare semiconductor arsenic, arsenic trioxide was used which does not contain any bismuth and contains only very small amounts of antimony, copper, aluminum, calcium, iron, silicon, and magnesium. The method applied involved purification of the arsenic trioxide by recrystallization from a hydrochloric acid solution. The purified arsenic trioxide was reduced with activated carbon. The methods applied for the control of the purity of the arsenic prepared in this manner are described in some detail.

77. Thermal and Electrical Properties of Native Lead Sulfide and Chalcopyrite

"Study of the Thermal and Electrical Properties of Native Galena and Chalcopyrite," by G. B. Abdullayev, G. M. Aliyev, V. B. Antonov, A. A. Bashshaliyev, A. Z. Kuliyev, and Ya. N. Nasirov; Riga, Izvestiya Akademii Nauk Azerbaydzhan SSR, Seriya Fiziko-Matematicheskikh Nauk, No 2, 1960, pp 49-55

In the temperature range 20-450 deg C, the electrical conductivity of native lead sulfide involves both impurity conduction and natural conductivity.

The electrical conductivity of chalcopyrite in the temperature range 20-650 deg C has an irregular dependence on temperature, which is apparently explained by the presence of various impurities.

In galena samples, the maximum coefficient of the thermo-emf fluctuated within the range 280-325 microvolts per degree, and within the range 480-500 microvolts per degree for chalcopyrite.

The coefficient of thermal conductivity of both galena and chalcopyrite drops with increased temperature.

Thermoelectric generators assembled from natural galena and chalcopyrite operate stably.

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78. Studies of ZnSe and ZnTe

Optical and Photoelectrical Properties of Zinc Selenide and Zinc Telluride," by G. A. Zhelkevich, Vologda State Pedagogical Institute; Moscow, Fizika Tverdogo Tela, Vol 2, No 6, Jun 60, pp 1115-1117

Studies of ZnSe and particularly of ZnTe, whose photoconductivity was recently discovered (B. T. Kolomiyets and N. A. Goryunova, Radiotekhnika i Elektronika, 1.8, 1155-1161 (1956)) were carried out. Properties of photoconductivity such as specific resistance, spectral dependence of the absorption coefficient, the width of forbidden zones, luminescence, and spectral distribution were determined.

79. Thermoelectric Properties of Sb_2Te_3-Bi-Te_3

"Thermo-Electric Properties of Alloys of the Sb_2Te_3 Pseudo-Binary System," by G. V. Kokosh and S. S. Sinani, Institute of Semiconductors, Academy of Sciences USSR, Leningrad; Moscow, Fizika Tverdogo Tela, Vol 2, No 6, Jun 60, pp 1118-1124

The effect of admixtures on the properties of alloys of the system Sb_2Te_3-Bi_2Te_3 is studied. A general schematic of the action of admixtures on solid solutions of semiconductors with a shifted stoichiometry is presented. The effect of tempering on the electric conductivity and thermo emf of pressed samples is shown. The properties of alloys prepared from materials with various degrees of impurity are compared. The part of the system with a maximum value of thermo emf was revealed.

80. Properties of GaSb

"Thermomagnetic Properties of Gallium Antimonide," by D. Kh. Amirkhanova, Dagestan Affiliate, Academy of Sciences USSR; Moscow, Fizika Tverdogo Tela, Vol 2, No 6, Jun 60, pp 1125-1127

Measurement results of the Nernst-Ettinghausen effect on GaSb samples of the p-type are presented in graphs. All samples exhibited a negative sign of the N-E effect at temperatures of 100-900°K, a decrease with rising temperatures and a minimum at high temperature. The longitudinal N-E effect bears analogy to the crosswise effect, differing only in the magnitude of the value.

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81. Properties of CdTe and ZnTe

"Electroconductivity and Photoelectrical Properties of Cadmium and Zinc Telluride Layers," by P. P. Konorov and I. B. Shevchenko, Leningrad State University; Moscow, Fizika Tverdogo Tela, Vol 2, No 6, Jun 60, pp 1134-1140

The electroconductivity and photoelectric properites of telluride layers of cadmium and zinc obtained by evaporation in vacuum were studied. Telluride layers of cadmium about one micron thick revealed after heating to 350-400°C a considerable photo-sensitivity in the visible and infrared spectral bands and may be used as photoresistors in these spectral bands. Some assumptions were made about the mechanism of activation of these layers. Telluride layers of zinc did not exhibit considerable photo-sensitivity, either after deposit or after thermal treatment.

82. Study of Semiconductor Surface Layer

"Determination of Mobility and Concentration of Carriers in the Surface Layer of a Semiconductor," by V. K. Subashiyev and S. A. Poltinnikov, Institute of Semiconductors, Academy of Sciences USSR, Leningrad; Moscow, Fizika Tverdogo Tela, Vol 2, No 6, Jun 60, pp 1169-1177

Methods for determining surface concentration and mobility on a semiconductor layer, due to diffusion formation of impurities into the initial sample, are described. The methods are based on measurements of the Hall effect and conductivity, and on use of the relation between mobility and the concentration of current carriers. Experimental data are provided, obtained from measurements on the diffusion layer of silicon photocells.

83. Study of ZnSb Single Crystals

Anisotropy of Some Electrical Properties of Zinc Antimonide Single Crystals," by M. V. Kot and I. V. Krestu, Kishinev State University; Moscow, Fizika Tverdogo Tela, Vol 2, No 6, Jun 60, pp 1250-1255

Methods for obtaining ZnSb single crystals and their electric properties are described. It was found that the mobilities of holes differ depending on crystallographic direction. The width of the forbidden zone computed from the temperature relation of the Hall effect, has a value of 0.6 ev.

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Aeronautical Engineering

84. Ratio Controller for Gas Pressures in Jet Engines

"Study of the Characteristics of Gas-Pressure Ratio Controllers Designed for Jet Engines," by L. A. Zalmanzon, Yu. L. Mach, and G. P. Stepanov; Avtomaticheskoye Regulirovaniye Aviadvigateley (Automatic Control of Aircraft Engines), Moscow, 1959, pp 5-73

The study of the precision of the transmitting elements of regulators for pressure ratio involves two problems. The first concerns the characteristics of various elements of the transducer (diaphragm, throttle, etc.) and of the interthrottle space, the determination of possible diversions of these characteristics, the study of friction in the moving parts of the transducer, and the determination of possible external influences. The second problem involves the determination of the influence of the above factors on the accuracy of measurement of the pressure ratios. The first part of this work presents an analysis of the influence of the errors of various elements on the resultant transducer error. The second part presents an analysis of supplementary errors which occur during the absence of a supercritical flow at the outlet from the interthrottle space of the transducer. An artificial reduction of gas pressure at this outlet through the use of ejectors is suggested as a means of broadening the area of proportional control of the pressures. This affords an adjustment of those errors which are connected with an infraction of the principle of proportional pressure control. Results are given of an investigation of jet and vortex-type ejectors for gas pressure ratio controllers.

Uncompensated errors resulting from friction and hysteresis effects in the diaphragm material are particularly unfavorable. Special experiments for the determination of the diaphragm error are described. The data given here refer only to tests on rubber-fabric diaphragms.

85. Laminar Flow of Air in Pneumatic Controllers

"Study of the Laminar Flow of Air in the Capillary Tubes of the Elements of Pneumatic Systems," by A. V. Bogacheva; Avtomaticheskoye Regulirovaniye Aviadvigateley (Automatic Control of Aircraft Engines), Moscow, 1959, pp 74-112

This article presents the results of research on the laminar flow of a viscous compressible gas (air) at high velocities in smooth capillary ducts with stationary and with one moving wall, conducted by the author in the period 1953-1955 under the direction of Prof A. V. Kvasnikov.

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86. Calculating Centrifugal Spray Nozzle

"Study and Calculation of the Centrifugal Spray Nozzle," by A. M. Prakhov; Avtomaticheskoye Regulirovaniye Aviadvigateley (Automatic Control of Aircraft Engines), Moscow, 1959, pp 113-183

Among others, B. S. Radcliffe (Proc. Inst. Mech. Engrs., Vol 169, No 3, 1955) attempted to study the centrifugal spray nozzle on the basis of the theory of dimensions, but the formulas for determining the basic operating parameters proved to be inadmissible for a wide range of relative dimensions of the proportioning elements.

On the basis of a brief analysis of various approaches to the problem, it is concluded that a method of calculating the centrifugal spray nozzle (which accounts for the viscosity of the working fluid) can be developed on the basis of equations of momentum, provided those assumptions are avoided which appreciably distort the actual processes in the spray nozzle. This approach is followed here in the calculation of the basic elements of a single-stage centrifugal nozzle, taking into account the primary design dimensions of the swirl chamber and tangential ducts, the design of the input to the nozzle, the length of the nozzle, the internal friction of the fluid, the friction of the fluid at the walls of the swirl chamber and nozzle, the coefficient of consumption of the tangential ducts, and the viscosity and specific gravity of the fluid. The method can also be applied for the case of a dual-nozzle device.

Atomic Engineering

87. Progress in Construction of Beloyarskoye Atomic Power Plant

"Builders of Atoms for Peace," by Ye. Anan'yev; Moscow, Izvestiya, 4 Oct 60

A wide Siberian highway leads to the Beloyarskoye (Beloyarskiy Rayon, Sverdlovskaya Oblast) Atomic Power Plant. Near the construction site is located the workers' settlement, Zarechnyy.

A totally new construction technology is applied at the Beloyarskoye Atomic Power Plant; here the reactor walls are assembled with 15-ton blocks. These huge, biological-concrete (shielding) blocks are lifted to a height of almost 40 meters. The reinforcing bars and the concrete forms for the uppermost section of the reactor, the 52-meter ventilating facility, are now being assembled.

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From the top of the construction the town of Asbest can be seen in the distance, and below can be seen a reservoir formed by damming the river Pyshma. The huge steel housing of the reactor, serving also as [illegible] biological protection, has already been installed. In a month or so, the actual installation of the reactor and its accessories will begin.

The Beloyarskoye Atomic Power Plant imeni I. V. Kurchatov, the first in the Urals and one of the most powerful in the nation, will soon begin to operate. The atomic station will incorporate the most modern type of equipment and instrumentation.

Automatic Control Engineering

88. New Electronic Device for Dimensional Control of Heavy Parts During Machining

"An Authorship Certificate has been Granted..." (unsigned article); Moscow, Ekonomicheskaya Gazeta, 21 Sep 60

"A group of Moscow inventors has developed an optic-electronic contactless method for dimensional control of parts during the process of their machining on turning lathes.

"The device incorporates a photocell, an induction-type data pick-up unit, and an electronic counter. These elements are connected in such a manner that the number of pulses uniformly admitted to the counter is limited by the photocell. The duration of the photocell signal corresponds exactly to the dimension of the examined projection.

"The process of measurement is reduced to simple pressing of a button by the operator and taking of the reading of the electronic counter.

"This new measuring device has been recommended for use in all fields of industry where large parts are machined on turning lathes."

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89. Forthcoming Conference on Automation Announced

"Announcement" (unsigned); Moscow, Avtomatika i Telemekhanika, No 7, 1960, back cover

The Institute of Automatics and Telemechanics of the Academy of Sciences USSR has announced that the Fourth All-Union Conference-Seminar on Pneumatic-Hydraulic Automation will be held in May 1961. The Organizational Bureau for the conference has requested that those wishing to participate in the conference should send titles and abstracts of reports to the following address: Moscow, Kalanchevskaya ul. 15-a, IAT AN SSSR, Orgbyuro Seminara po Pnevmo-Gidravlicheskoy Avtomatike.

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Civil Engineering

90. Proposed New Method of Microseismic Regioning

"Instrumental Microseismic Regioning Based on High-Frequency Microseisms," by D. N. Kazanli and E. M. Antonenko; Alma-Ata, Izvestiya Akademii Nauk Kazakhskoy SSR -- Seriya Geologicheskaya, No 2 (39), 1960, pp 112-124

A new instrumental method of microseismic regioning based on high-frequency microseisms has been proposed by D. N. Kazanli and E. M. Antonenko of the Institute of Geological Sciences, Academy of Sciences Kazakh SSR. The method consists in recording and interpreting the small natural oscillations of the Earth's surface, the parameters of which (amplitudes, periods), as established by the authors, are determined by pecularities of the geological structure and the nature of the soils. The studies by Kazanli and Antonenko were made over a 3-year period on the city of Alma-Ata. They are connected with the need for careful research on the distribution of seismic effects in cities, that is, seismic regioning, because of the development of industrial, residential, and hydroengineering construction in the Soviet republics located in earthquake-prone regions.

Electrical Engineering

91. Completion of Largest Soviet Hydrogenerator

"For the Bratsk Hydroelectric Station" (unsigned article); Moscow, Ekonomicheskaya Gazeta, 17 Sep 60

The article contains the following passages:

"The collective of the Leningrad plant 'Elektosila' has completed ahead of schedule the first hydrogenerator for the Bratsk Hydroelectric Station. The rated capacity of this machine is 225,000 kw, which is equivalent to two generators of the Stalingrad Hydroelectric Station or to 3 1/2 of the Volkhov Hydroelectric Station.

"The workers of the 'Elektrosila' plant will apply all their efforts and experience to give the nation before the end of this year, i.e., ahead of schedule, the first turbogenerator with a rated capacity of 300,000 kw."

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92. Horizontal Hydraulic Turbines Fell Short of Expectations

"Hydroelectric Stations With Horizontal Units," by B. K. Aleksandrov, Moscow, Gidrotekhnicheskoye Stroitel'stvo, No 6, Jun 60, pp 1-8

The basic advantage of horizontal hydraulic turbines with straight draft tube is their greater water-carrying capacity, exceeding considerably the water-carrying capacity of corresponding vertical turbines with bent draft tubes. The efficiency of horizontal turbines, on the basis of model tests, is also considerably higher than for the vertical turbines.

"Unfortunately, the Leningrad Metals Plant has manufactured for the Kama Plant a horizontal turbine with considerably lower operating characteristics: the efficiency at full load is only 0.87 and the maximum water-carrying capacity is only 2,200 liters/sec, i.e., similar to that of an equivalent vertical turbine.

"Unfortunately, the laboratory tests of hydraulic turbines with horizontal shaft have never been, nor are they at present, given proper consideration at the Leningrad Metals and Khar'kov Hydroturbine plants. The excuse generally given -- that the plants do not possess the necessary laboratory facilities -- cannot be regarded as satisfactory. Not denying the necessity for expansion of laboratory facilities at the plants, it can be pointed out that the existing hydraulic-turbine laboratories of the higher educational institutions and the scientific research institutes might have been called to participate in these investigations."

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High-Speed Photography

93. High-Speed Photography Apparatus

"Apparatus for High-Speed Spark Photography," by G. D. Salamandra and I. K. Sevast'yanova; Minsk Inzhenerno-Fizicheskiy Zhurnal, Vol 3, No 9, Sep 60, pp 31-36

The authors describe an apparatus for spark photography by the schlieren method at speeds up to 100,000 frames per second with a delay of the order of 10^{-7} sec.

The apparatus consists of a high-voltage rectifier, oscillating circuit permitting spark sequence with easily regulated delay, impulse (spark) tube, photo recorder which provides for linear film movement at 185 m/sec, and a synchronizing unit. The pulse tube is of original design and operates on practically inductionless condensers.

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An example is given of the operation of the apparatus, illustrated by a photo series showing shock wave-flame front interaction, taken at 40,000 frames per second on aerial pan film rated 800 GOST.

The work was done at the Laboratory of the Physics of Combustion, Power Engineering Institute of the Academy of Sciences USSR, under the direction of A. S. Predvoditelev, Corresponding Member of the Academy.

Mechanical Engineering

94. Dynamics of Nonlinear Servomechanisms

Dinamika Nelineynykh Servomekhanizmov (Dynamics of Nonlinear Servomechanisms), by N. S. Gorskaya, I. N. Krutova, and V. Yu. Rutkovskiy, Institute of Automatics and Telemechanics, Academy of Sciences USSR, Moscow, 1959, 317 pp

On the assumption that the theory of servomechanisms has not been fully developed and the study of the dynamic properties of servomechanisms has not been fully studied, in spite of the enormous number of published works on the subject (the appended bibliography cites 130 sources), this book is presented as an attempt to fill the gap for a wide class of servomechanisms, the behavior of which can be described approximately or precisely by differential equations of the second, and in some cases the third, order.

The material of the book is based on work done by the authors in the period 1954-1958 at the Automatic Control Laboratory of the Institute of Automatics and Telemechanics of the Academy of Sciences USSR.

Methods of studying the dynamics of nonlinear servomechanisms are discussed, which are based on the phase-space approach and the theory of collinear transformations developed in the classical works of A. A. Andronov and his school. A detailed study is also made of the phase space in regard to certain types of nonlinear servomechanisms. Electropneumatic, hydraulic, and electrical servomechanisms are discussed.

95. Choice of a Determining Temperature in Calculating Convective Heat Transfer and Friction in Dynamic Gas Conditions

"The Choice of a Determining Temperature in Calculating Convective Heat Transfer and Friction in Dynamic Gas Conditions," by S. I. Kosterin and Yu. A. Koshmarov, Power Institute imeni G. M. Krzhizhanovskiy; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 7, 1960, pp 3-9

For the calculation of local values of the coefficients of friction and heat transfer on the surface of a body in dynamic gas conditions, we can use the laws of friction and heat exchange established for

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noncompressible fluids, calculating the effect of compressibility by relating density and viscosity in these laws to a determining temperature.

The value of the determining temperature in the general case depends on M, Re_{α} $Re_{\beta o}$, Pr and on the form of laws of resistance and heat transfer for noncompressible fluids used in the calculation method.

When Pr is close to unity and for zero or small negative pressure gradients, the value of the determining temperature can be determined by a formula, taking into account relationships given by two other formulas. These formulas are correct for

$$Re_{\beta o} = 10^3 \div 10^4;\ T_w = 1 \div 0.5 \text{ and } M = 1 \div 10$$

Miscellaneous

96. Introduction of Improved Methods to Industry Is Slow

"Resolutions of the Central Comittee CPSU July Plenum -- Activity Program for Inventors in the Field of Engineering" (unsigned article); Moscow, Izobretatel' i Ratsionalizator, No 9, Sep 60, p 2

The article contains the following passages:

"The First Congress of the All-Union Society of Inventors and Rationalizers has approved a resolution to create a 100-billion [rubles?] fund commemorating the Seven-Year Plan. The struggle to achieve this obligation ahead of the scheduled time should become the general feature of our activity.

"Savings through the introduction of rationalizer suggestions have amounted to about 20 billion rubles in 1 1/2 years. This shows that not all of the organizations of the society have fully applied their efforts to the struggle to fulfill the obligations assumed by the collectives of enterprises and economic regions.

"Our councils and primary organizations have failed to properly execute control over the introduction of inventions and rationalizer suggestions into industry. During 1957-1959, about 26,400 authorship certificates (patents) were issued, yet only 4,650 inventions were introduced into industry."

"More than 500,000 inventions and rationalizer suggestions have been waiting since 1 January 1960 to be introduced into industry."

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97. Higher Educational Institutions Cooperating With Industry

"Higher Educational Institutions and Technical Progress," by B. Pokrovskiy; Moscow, Ekonomicheskaya Gazeta, 19 Aug 60

The article contains the following passage:

"Five Leningrad institutes -- the Polytechnic Institute imeni Kalinin, the Technological Institute imeni Lensovet, the Electrical Engineering Institute imeni V. I. Ul'yanov, the Institute of Precision Mechanics and Optics, and the Engineering-Economics Institute -- have advanced a very remarkable proposition. They have concluded with the industrial enterprises not annual agreements on creative cooperation, but agreements for a period of 7 years. These agreements provide for assistance to the enterprises in their efforts to fulfill ahead of schedule assignments in national economy planning, and for help with automation and mechanization of industrial processes and with training and improvement of the qualifications of technical-engineering personnel and workmen. At present more than 140 seven-year agreements have been concluded with the higher educational institutions."

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V. MATHEMATICS

98. Oscillating Solution of Differential Equation Studied

"Concerning the Asymptotic Behavior of the Oscillating Solution of a Linear Homogeneous Differential Equation of the Second Order With a Retarding Argument," by S. B. Norkin, Calininsk Peat Institute; Moscow, Nauchnyye Doklady Vysshey Shkoly, Fiziko-Matematicheskiye Nauki, No 3, Apr 60, pp 48-56

The asymptotic behavior of the oscillating solution of the linear differential equation of the second order

$$y''(t) + \lambda y(t) + M(t)y(t - \Delta(t)) = 0 \quad (A \leq t < \infty),$$

with a retarding argument is investigated where the function $M(t)$ and $\Delta(t) \geq 0$ are given continuous for $A \leq t < \infty$, and λ a positive parameter.

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99. Nonlinear Differential Equations of Third and Fourth Order Investigated

"Concerning the Existence of a Periodic Solution for Nonlinear Equations of the Third and Fourth Order," by E. M. Vaysbord, Moscow State University imeni M. V. Lomonosov; Moscow, Nauchnyye Doklady Vysshey Shkoly, Fiziko-Matematicheskiye Nauki, No 3, Apr 60, pp 10-13

The work is devoted to the problem concerning existence of a periodic solution for the following nonlinear equations:

$$\frac{d^3x}{dt^3} + \frac{d^2G_1(x)}{dt^2} + \frac{dG_2(x)}{dt} + G_3(x) = 0, \tag{1}$$

$$\frac{d^4x}{dt^4} + \frac{d^3G_1(x)}{dt^3} + \frac{d^2G_2(x)}{dt^2} + \frac{dG_3(x)}{dt} + G_4(x) = 0. \tag{2}$$

Equations of this form are analogous to the equation of the second order

$$\frac{d^2x}{dt^2} + \frac{dG_1(x)}{dt} + G_2(x) = 0, \tag{3}$$

for which the problem concerning the existence of a periodic solution has been well studied.

The following assumptions are made relative to the functions $G_i(x)$. Each term of equation (1) is (3-i) times continuously differentiable and each term of equation (2) is (4-i) times continuously differentiable (the zeroeth derivative is understood as the function itself). In addition, the functions $G_3(x)$ in equation (1), and $G_4(x)$ in equation (2) are differentiable at zero.

Finally it is assumed that $G_i(0) = 0$. The notations $g_i(x) = \frac{G_i(x)}{x}$ for $x \neq 0$, $g_i(0) = G'_i(0)$ are introduced.

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It is easy to see that the functions $g_i(x)$ are continuous for $-\infty < x < +\infty$ and that $G_i(x) = g_i(x)x$. By the means of substitution: (4)

$$x_1 = x, \quad x_i = x'_{i-1} + G_{i-1}(x), \quad i = 2, 3, 4.$$

Equations (1) and (2) are reduced to the systems:

$$\begin{aligned} \frac{dx_1}{dt} &= x_2 - g_1(x_1)x_1, \\ \frac{dx_2}{dt} &= x_3 - g_2(x_1)x_1, \\ \frac{dx_3}{dt} &= x_4 - g_3(x_1)x_1, \\ \frac{dx_4}{dt} &= -g_4(x_1)x_1. \end{aligned} \tag{5}$$

By the method of point transformations relative to these systems three theorems are proved concerning the existence of a periodic solution, different from the trivial solution.

100. A Differential Inequality of Fourth Order Investigated

"Concerning a Differential Inequality of the Fourth Order," by Yu. P. Gor'kov, Moscow State University imeni M. V. Lomonosov; Moscow, Nauchnyye Doklady Vysshey Shkoly, Fiziko-Matematicheskiye Nauki, No 3, Apr 60, pp 22-24

It is known that a function $y(x)$ satisfying the inequality

$$y'' + a(x)y' + b(x)y \leq 0 \quad (b(x) < 0)$$

on the segment [c, d] cannot attain a negative minimum at an internal point of the segment. It follows that if $y(c) \geq 0$, $y(d) \geq 0$, then $y(x) \geq 0$ on the segment [c, d].

In the present work on analogous assertion is proved for functions satisfying the differential inequality of the fourth order

$$y^{(4)} - a(x)y'' + b(x)y \geq 0,$$

where $a(x)$ and $b(x)$ are continuous positive functions on the segment [c, d].

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101. Linear Differential Equations With Periodic Coefficients

"On the Solution and Characteristic Exponents of Solutions of Certain Systems of Linear Differential Equations With Periodic Coefficients," by K. G. Valeyev, Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 4, 1960, pp 585-602

A method is presented for solving certain systems of linear differential equations with periodic coefficients with the use of the Laplace transformation. The results are used to find the characteristic exponents of the solutions of systems close to stationary.

Criteria are given for the stability of the solutions of an equation of the second order with periodic coefficients in the case of resonance.

102. n-Harmonic Functions

"On Certain Properties of n-Harmonic Functions," by A. S. Dzhafarov; Baku, Izvestiya Akademii Nauk Azerbaydzhanskoy SSR, Seriya Fiziko-Matematicheskikh i Tekhnicheskikh Nauk, No 2, 1960, pp 3-18

The article demonstrates certain direct and inverse theorems regarding the best approximation of n-harmonic functions by means of n-harmonic polynomials. The results obtained afford the possibility of establishing, on the basis of the differential properties of the boundary function, similar properties of the corresponding harmonic function and, conversely, of establishing the properties of the boundary function on the basis of the differential properties of the harmonic function.

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Epidemiology

103. Extermination of P. pestis Carriers

"The Fate of the Plague Microorganism in Connection With the Extermination of Its Rodent Carriers," by M. S. Drozhevkina, Tr. Rostovsk. n/D. Gos. N.-I. Protivochumn. In-ta (Works of the Rostov-na-Donu State Scientific Research Antiplague Institute), No 4, 1957, pp 109-121 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 60, Abstract No 54380, by N. Nikitina)

"The extermination of rodents leads to the disruption of the natural conditions for the existence of the microorganism and causes its death in the end, i.e., in the author's opinion is a prospective method for the eradication of plague foci."

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104. Eradication of Infectious Diseases in Ukrainian SSR Discussed

"Theoretical Bases and Practical Possibilities of Eradicating Infectious Diseases in the Ukrainian SSR," by Yu. Ye. Birkovskiy, N. F. Kompantsev, and A. S. Korotich, Sanitary-Antiepidemic Administration, Ministry of Health Ukrainian, and Kiev Institute of Epidemiology and Microbiology; Kiev, Vrachebnoye Delo, No 8, Aug 60, pp 82-85

The authors note initially that not only has a significant decrease been achieved in the incidence of such dangerous infections as plague, cholera, smallpox, glanders, Dracunculus medininsis infestation, typhus, and malaria, but that they have been completely eradicated. The authors also advise adherence to the viewpoint that biological succession lies at the basis of any epidemic process, but that many features of this process are determined by social factors. In their opinion, the theories of "bourgeois epidemiologists" must be resolutely rejected. The eradication of plague in an epidemic form in the Ukrainian SSR while the virulence of the pathogen has not been altered and while pulmonary plague remains as lethal as before is cited in support of this stand.

In January 1960, the Central Committee CPSU issued a decree on "Measures for the Further Improvement of Medical Service and Preservation of the Health of the Population of the USSR," which stated that the conditions

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necessary for the further decrease and complete eradication of infectious diseases now exist. The party and government assigned the task of operating on the basis of local conditions to take measures which would guarantee the eradication of diphtheria, tularemia, poliomyelitis, and a number of other infections with local import and which would sharply decrease the incidence of typhoid, whooping cough, ascaridosis, acute intestinal infections, and brucellosis. Medical workers in the Ukrainian SSR, the article states, have made great progress with the assistance of party and government organizations.

Incidences of several diseases from 1940 to 1959 are compared. Eradication, it is said, will be accomplished by decontaminating the sources of infection, breaking the chain of transmission, and immunizing the population specifically. The significance of various antiepidemic measures in different diseases is discussed. More intensive measures are recommended in the south and southeastern parts of the Ukrainian SSR, especially with regard to dysentery.

In a discussion of childern's diseases in the entire republic, it is noted that the incidence of diphtheria is lower in the Ukrainian SSR than in the other republics and that its complete eradication is possible within the next 2 or 3 years. The use of absorbed diphtheria anatoxin for inoculation is advocated.

Measures for the eradication of brucellosis among humans are discussed; the eradication of anthrax and tularemia among humans is also considered within the realm of possibility. Epidemic hepatitis, influenza, and tuberculosis are mentioned.

The authors note in conclusion that the control of infectious diseases and helminthoses requires increased knowledge of medical workers in the areas of diagnosis, therapy, and prophylaxis and that the workers of scientific research institutions and medical institutes must devote themselves to this task.

Immunology and Therapy

105. Brucellosis Vaccine Tested on Large Group of People

"The Problem of the Effectiveness of the Cutaneous Method of Immunizing Humans With Vaccine From Br. abortus Strain 19-BA," by I. F. Taran, Scientific Research Antiplague Institute of the Caucasus and Transcaucasus; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 8, Aug 60, pp 93-96

This article reports the author's study of the effectiveness of cutaneous vaccination of 2,750 persons with a preparation from Br. abortus strain 19-BA in four rayons of the Kalmytskaya ASSR. A vaccine prepared

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at the Institute of Epidemiology and Microbiology imeni Gamaleya (series 82-1, 62-1, and 116) was used; one human dose contained 2 billion live Brucella in 0.05 ml of physiological solution. The dose was applied at two sites, double crossed scratches 1-1.5 cm long were made, and the vaccine was rubbed into the scratches.

The epizootiological conditions on each of the farms where the vaccinates were located are described briefly. Tables show results of examination of the vaccinates one year after inoculation and the percentage of effectiveness in the four rayons involved.

The following conclusions are offered:

1. Cutaneous vaccination with Br. abortus 19-BA vaccine in a dose of 2 billion microbial cells is harmless for humans with both positive and negative Burnet reactions.

2. A postvaccination reaction was noted in a significant number of vaccinates 2 1/2 months after inoculation.

3. The possibility of a breakdown in immunity and the occurrence of brucellosis among persons inoculated cutaneously is not excluded in foci of ovine brucellosis where there are mass abortions and when elementary sanitary-hygienic rules are not strictly observed.

106. Allergic Reaction to Pestin Described

"The Nature of an Allergic Reaction to Pestin in Persons Vaccinated Against Plague," by M. F. Shmuter, L. G. Lopatukhina, I. F. Volosivets, Tr. Sredneaz. N.-I. Protivochumn. In-ta (Works of the Central Asian Scientific Research Antiplague Institute), No 4, 1958, pp 107-109 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 60, Abstract No 54378, by M. Boyarskaya)

"The intracutaneous test suggested by Ye. I. Korovkova with 'Pestin' a killed suspension of plague pathogens) was performed on persons who had been vaccinated against plague. In the first experiment, the reaction to pestin was tested in 309 persons who had been vaccinated intracutaneously and cutaneously, and in nonvaccinated controls. It was demonstrated that about half those who had been vaccinated intracutaneously had strongly positive and intense reactions, about one third had positive and weakly positive reactions, and only 8% did not react to the introduction of pestin. Those vaccinated cutaneously reacted much more weakly to pestin. About 50% of the control group did not react, 16.8% reacted positively, and 13.6% had sharply positive reactions. In the second experiment, the reaction to pestin was tested in 138 nonvaccinated persons. The total percent

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of nonspecific reactions and their intensity were partially decreased by decreasing the dose of pestin or inactivating it, but they were not completely eliminated. It was established that skin sensitization, which can be developed by the introduction of pestin, occurs as a result of anti-plague vaccination. However, aside from the nonspecific reactions it is still not impossible to recommend the allergic reaction for wide practical use."

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107. Sensitivity of Different Animals to Gas Gangrene Compared

"The Comparative Sensitivity of Experimental Animals to Gas Gangrene," by F. A. Chertkova, Ye. S. Shain, and T. P. Kozhevnikova, Materialy po Obmenu Opytom. Gl. Upr. In-tov Vaktsin i Syvorotok M-va Zdravookhr. (Data on Exchange Experiments of the Main Administration of Institutes of Vaccines and Sera, Ministry of Health), 1/53, 1957, pp 299-304 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 60, Abstract No 54393, by M. Boyarskaya)

"Rabbits, guinea pigs, and mice were infected intramuscularly with 0.1 ml of a stable glycerine suspension of pathogens in a mixture of 0.1 ml of a 50% $CaCl_3$ solution and the same amount of a suspension without calcium. The use of $CaCl_3$ decreased the certain lethal dose by 100-1,000,000 times. Rabbits and guinea pigs had approximately identical sensitivity to Clostridium perfringens; the sensitivity of mice was 12-15 times lower. Rabbits were 10 times more sensitive than guinea pigs and 15 times more sensitive than mice. The sensitivity of rabbits and guinea pigs to Vibrion septique was identical, but rabbits were twice as sensitive to its toxin as guinea pigs; rabbits were five times more sensitive to Cl. histolyticum, and were two times more sensitive to its toxin than guinea pigs. Mice were 20 times less sensitive to Cl. histolyticus. White mice were considerably less sensitive to the pathogens of gas gangrene than to its toxins."

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108. Effect of Aminazine of Reflex Activity

"On the Mechanism of the Action of Aminazine on Higher Nervous Functions," by M. M. Khananashvili, Physiological Division imeni I. P. Pavlov, Institute of Experimental Medicine, Academy of Medical Sciences USSR; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 4, Jul/Aug 60, pp 295-299

In the experiments carried out on dogs it was established that aminazine in a dose of 0.5 milligram per kilogram of body weight modified conditioned reflex activity in the animals. The modifications occurred about 50 minutes after the drug was administered and were expressed by a slower response to a stimulus with the aid of which the conditioned reflex was developed. Doses of aminazine of one milligram per kilogram of body weight substantially disturbed conditioned reflex activity, while still larger doses completely changed the nature of the reflex. Some researchers think that the effect of aminazine on reflex activity is due to the action of the drug on the cerebral cortex; the possibility of its action on the subcortical structures is not excluded.

109. Toxicity of Some Organophosphorus Compounds

"On the Toxicology of O,O-Dialkyl-beta-alkylmercaptoalkyl Dithiophosphates (Insecticides M-74, M-81, and M-82)," by Yu. S. Kagan (Kiev), Institute of Labor Hygiene and Occupational Diseases; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, Vol 4, No 9, Sep 60, pp 21-26

Mice, rats, and cats were used in the experiments which were conducted to determine the toxicity of the insecticides M-74 --O,O-diethyl-beta-ethylmercaptoethyldithiophosphate; M-81 -- O-O-dimethyl-beta-ethylmercaptoethyldithiophosphate; M-82 -- O-O-dimethyl-methylmercaptoethyldithiophosphate. The insecticides were introduced into the organisms of the animals through the gastrointestinal tract, the respiratory organs, and the undamaged skin. The experiments established that M-74, M-81, and M-82, and M-74 in particular, are highly toxic to the animal organism; the compounds have a cumulative effect; the depression of cholinesterase activity plays an important part in the mechanism of the toxic effect of the poisons; on the basis of the experimental data obtained it is recommended that the insecticides M-81 and M-82 be used instead of M-74 and that the allowable concentration of the vapors of M-81 and M-82 should not exceed 0.0001 milligram per liter.

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110. Toxicity of Some Compounds

"Acute Toxicity of Dibutyl Phthalate and di-2-ethylhexyl Phthalate of Polish Production," by S. Homrowski and M. Nikoronov, Roczn. Ranstw. Zakl. Hig (Poland), 1959, 10, No 4, 321-327 (from Referatuvnyy Zhurnal-Khimiya, Biologicheskaya Khimiya, No 16, 25 Aug. 60, Abstract No 23578, by the Authors)

"Experiments carried out on rats established that the LD_{50} of dibuthyl phthalate when administered by mouth was 11.9 milliliters per kilogram of body weight, and when administered intraperitoneally, 6.8 milliliters per kilogram of body weight; the LD_{50} of di-2-ethylhexyl phthalate when administered by mouth was 33.7 milliliters per kilogram of body weight, and when administered intraperitoneally, 37.3 milliliters per kilogram of body weight. The blood picture of the experimental animals did not differ from that of the control rats. Degenerative hepatic modifications were noted in the animals which received dibuthyl phthalate."

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111. Amine Toxicity

"Investigations of the Toxicity of Amines. 1. Effect of Amines on Glutathione in vitro," by Ewa Sikorska, Roczn. Panstw. Zakl. Hig. (Poland), 1959, 10, No 3, 245-262 (. (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 15, 10 Aug 60, Abstract No 22088, by the author)

"The effect of p-aminophenol (I), p-phenylenediamine (II), and p-toluoldiamine (III) on the content of glutathione in aqueous solutions, 0.9 percent solutions of NaCl, and in blood was investigated. It was found that all the amines under investigations reduced the glutathione content in the mentioned solvents. This reduction was considerably greater in the blood than in the solutions of NaCl and water. (1) was the more active of the amines; the action of (II) and (III) was about eq equal."

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112. Cadmium Oxide Intoxication

"Acute Occupational Intoxications by Cadmium Oxide and Their Prophylaxis," by R. S. Vorob'yeva, First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, Vol 4, No 7, Jul 60, pp 44-45

Several cases of intoxication by cadmium oxide are described. Cadmium oxide is now widely used in industry and cases of intoxication by this compound have become more frequent. The clinical picture of cadmium oxide

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intoxication is specific for the metal. It is characterized by a latent period, disturbances of the gastrointestinal tract and respiration organs, and a change in the blood picture. Improved methods of processing the metal and proper ventilation are recommended as prophylactic measures.

113. Mercaptoalkansulfonates as Antidotes in Arsenic Poisoning

"Comparative Evaluation of the Toxic and Antidote Properties of Certain Derivatives of Mercaptoalkansulfonates," by I. G. Mizyukova and D. S. Lokantsev, Laboratory of Pharmacology, Ukrainian Scientific Research Sanitary-Chemical Institute; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 4, Jul/Aug 60, pp 355-361

A number of thiol compounds, derivatives of mercaptoalkansulfonates were tested for their toxicity and for their antidote properties when used in the therapy of arsenic and other heavy metal intoxications. The antidote properties of these compounds were compared with those of unithiol -- sodium 2,3-dimercaptopropanesulfonate -- a preparation now widely used as an antidote in arsenic intoxications. Rats were used in the experiments which established that the thiol compounds under investigation are slightly toxic, having an LD_{100} of 1,000-2,300 milligrams per kilogram of body weight; the dithiols which contain two SO_3 groups were found to be the least toxic of the group under investigation; the antidote properties of the thiols have been found to vary, depending on the quality and disposition of the SH groups in the compounds; no direct relationship between the toxic and antidote properties of the compounds has been established, although it is thought that the structure of the thiol molecule can to some degree affect the toxic and antidote properties of preparations.

114. Toxicology of Some Hydrocarbons

"On the Toxicology of Aromatic Hydrocarbons. Report 1. Comparative Toxicity of Some Aromatic Hydrocarbons. Report 2. Certain Problems of the Toxicohygienic Characteristics of Aromatic Hydrocarbons," by A. S. Faustov, Tr. Voronezhsk. Med In-ta (Works of the Voronezh Medical Institute), 1958, 35, 247-255 (from Referativnyy Zhurnal-Khimiya, Biologicheskaya Khimiya, No 14, 25 Jul 60, Abstract No 20718, by T. Brzhevskaya)

"The absolute lethal concentrations (in milligrams per liter) of the following hydrocarbons were established in acute experiments on animals: benzene, 45 for mice and 60 for rats; toluol, respectively 35 and 50; ethylbenzene, 50 and 70; xylol (a mixture of isomers), 55 and 75; styrol,

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45 and 55. The minimal concentrations of the compounds acting on the central nervous system of rabbits were found to be as follows: benzene, 1.5; toluol, 1; ethylbenzene, 0.78; xylol, 0.75; styrol, 0.62; and diisopropylbenzene, 0.62. The concentrations which induced a lateral position in mice were as follows: benzene, 15; toluol, 10; ethylbenzene, 15; xylol, 20; styrol, 10. LD_{50} for mice were benzene, 30; toluol, 25; ethylbenzene, 35.5; xylol, 39; styrol, 34.5. Toluol was found to be the most toxic of the hydrocarbons; styrol and diisopropylbenzene the least toxic. It is assumed that effective toxicity in the homologous series of I decreases from the lower to the higher members; the average toxicity at the level of small concentrations is more in accordance with Richardson's law than it is when at the level of the lethal and anesthesizing concentrations. The absolute lethal doses (grams per kilogram of body weight) when intraperitoneally administered to 195 rats were found to be: benzene, 10; toluol, 8; ethylbenzene, 6; xylol, 9; styrol, 8; diisopropylbenzene, 10. The absolute lethal concentrations for fish in water (in milligrams per liter) after 24-hour exposure were as follows: benzene, 45; toluol, 55; ethylbenzene, 60; xylol, 55; styrol, 40. It is assumed in this case that the toxicity of the hydrocarbons decreased with an increase in the molecular weight of the substances and the diminution of their solubility in water. Organoleptic investigations of water polluted with aromatic hydrocarbons established that their odor and taste intensity increase with the increase in the molecular weight and that the practical threshold for taste in all cases was lower than the corresponding threshold for odor. The practical threshold ratios for taste and odor in water were found to be as follows: 2.1 and 7.1 for benzene; 1.1 and 2.9 for toluol; 0.1 and 0.2 for ethylbenzene; 0.6 and 1.6 for xylol; 0.08 and 0.19 for styrol; 0.25 and 0.25 for diisopropylbenzene. The lowering of the threshold of allowable concentration of homologues of benzene in the air of industrial premises is urged.

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115. Research on CO Poisoning

"Hygienic Evaluation of the Risk of Chronic Action of Carbon Monoxide Fumes on the Workers of a Generator Station," by V. Svestkova, B. Svestka, and Z. Frajbis, Zh. Gigiyeny, Epidemiol., Mikrobiol. i Immunol. (Czech), 1959, 3, No 6, pp 328-342 (from Referativnyy Zhurnal-Khimiya, No 14, 25 Jul 60, Abstract No 57634)

Carbon monoxide (CO) (0.009-1.700 mg/l) has been detected in the atmosphere of the working areas of a generator station. An increased content of CO was noted in the blood of 51.8% of the workers. During the medical examination of 46 workers of the station (the average age was 45 years, length of service was 2-38 years) complaints were registered of headaches (by 28 people) dizziness (by 9), increased fatigue (by 2), loss of appetite (by 3), coughing (by 23), etc. The quantity of erythrocytes observed in 27 examinees was 5,000,000/ml, hemoglobin 100% in 28. About 35% of the examinees suffered acute CO poisoning in the past (in a few cases more than once). Chronic CO poisoning was

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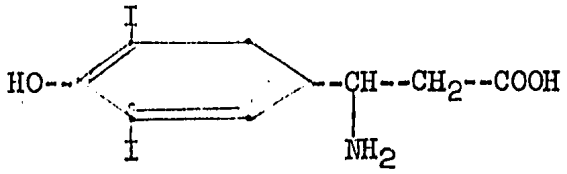
not observed. The following recommendations were made: increasing the ventilation, especially in the summer; automation of the processes for leading the coal; and consideration for the necessity for a sufficiently greater volume of air during the designing of production areas.

116. Therapy of Thyrotoxicosis

"Betazin," by Z. L. Izumrudova, All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze; Moscow, Meditsinskaya Promyshlennost' SSSR, Vol 14, No 8, Aug 60, pp 42-43

Betazin -- beta-(4-oxy-3,5-diiodophenyl)-beta-alanine -- was synthesized by V. M. Rodionov, N. N. Suvorov, and V. G. Avramenko of the Chair of Organic Chemistry at the Moscow Chemicotechnological Institute imeni D. I. Mendeleyev. Its structural formula is as follows:

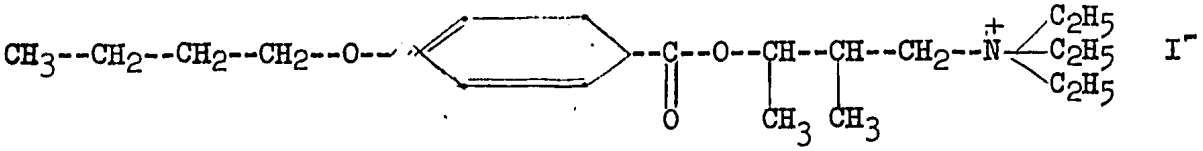


Betazin is a colorless crystalline substance, soluble in aqueous solutions of acids and alkalines and insoluble in alcohol, ether, and other organic solvents. Experimental investigations established that betazin is highly effective in thyrotoxicosis therapy. It is nontoxic and is well tolerated by patients. This is of particular importance in cases in which the patients cannot tolerate iodine.

117. Quatelerone -- New Ganglioblocking Drug

"Pharmacological Characteristics of Quatelerone," by N. Ye. Akopyan and R. A. Aleksanyan, Section of Pharmacology, Institute of Fine Organic Chemistry, Academy of Sciences Armenian SSR; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 4, Jul/Aug 60, pp 316-321

Albino mice, rabbits, and cats were used in experiments which were conducted to determine the effect of quatelerone on the organism. Quatelerone is the iodoethylate of alpha-beta-dimethylaminopropyl ester of p-butoxybenzoic acid; it is the quaternary derivative of ganglerone. Its structural formula is as follows:



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Quatelerone is a white fine-crystalline powder, readily soluble in water when heated; its melting point is 128-130 degrees; it has a bitter taste. The experiments established that quatelerone has an expressed effect on the cholinoreactive structure of the automatic nervous system; it has strong blocking effect on the nicotine-cholino-reactive systems of the automatic ganglia; it has a curare-like action; it has a hypotensive effect, restoring to normal the blood pressure of animals with pituitary hypertension; it does not affect the cholinoreactive system of the central nervous system, is slightly toxic and well tolerated by the organism.

118. Inexpensive Method of Preparation of Ergosterine

"Mycelium of Penicillin as a Source of Ergosterine," by S. S. Manko, Tr. Vses. n.-I. Vitamin. In-T (Works of the All-Union Scientific Research Vitamin Institute), 1959, 6, 92-97, (from Referativnyy Zhurnal-Khimiya, No 10, 25 May 60, Abstract No 39698, by A. Vavilova)

"In the search for an inexpensive raw material for the preparation of ergosterine, investigations of the mycelium of penicillin were conducted. It was found that ergosterine is contained in the mycelium of penicillin in two forms: a fraction which is readily extracted with alcohol, and a fraction which is firmly combined with the cellular protein. The generally used method of analysis of ergosterine in which an alkaline wash is used fails to separate the ergosterine from the protein and therefore produces a low yield. Autoclaving of the fresh mycelium of penicillium separates the ergosterine to a greater degree than does the fermentation process. The yield of crystalline ergosterine is increased when increased pressure on mycelium is applied during the autoclaving process. The processing of the partially decomposed mycelium of penicillium produces higher yields. Dry mycelium rapidly loses its ergosterine: 87 percent of it is lost in 10 days of storage. Tables on the results of the experiments are provided."

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119. Fubromegan -- New Spasmolytic Drug

"Pharmacological Properties of Fubromegan," by R. A. Alekasnyan, Section of Pharmacology, Institute of Fine Organic Chemistry, Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademiin Nauk Armyanskoy SSR, Vol 13, No 3, Mar 60, pp 55-61

Fubromegan, a spasmolytic drug with a wide spectrum of action, was synthesized by A. L. Mndzhoyan and V. G. Afrikyan of the Academy of Sciences Armenian SSR. Chemically it is the

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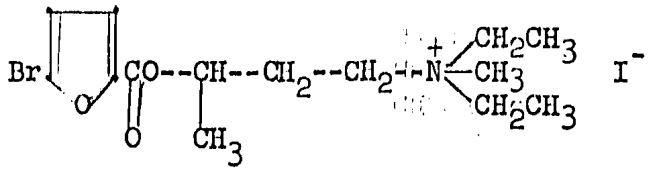
iodomethylate of alpha-methyl-gamma-diethylaminopropyl ester of 5-bromofurancarboxylic acid. Its structural formula is as follows:



Fubromegan is a light-yellow powder bitter in taste; it is readily soluble in water and insoluble in ether and benzene. Its melting point is 142-148 degrees; it has a molecular weight of 460. Tests carried out on cats established that fubromegan is an effective spasmolytic drug due to its strong muscarinolytic and nicotinolytic properties; in doses of 0.2-0.4 milligrams per kilogram of body weight it increases the flow of blood from the coronary aorta by 10-20 percent; it is slightly toxic; in experiments on rabbits, the toxic dose of the drug for these animals was established at 25 milligrams per kilogram of body weight; this exceeds the minimally effective therapeutic dose 125 times.

120. High Curarelike Activity Reported for α -Truxillic Acid Esters

"Investigation of a Series of Cyclobutanedicarboxylic Acids. III. Basic Esters of α-Truxillic Acid," by A. P. Arendaruk and A. P. Skoldinov, Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 8, Aug 60, pp 2743-45

A description is presented for the synthesis of a number of dialkylaminoalkyl esters of α-truxillic acid. The authors reported that the pharmacological investigations of the synthesized preparations (conducted by D. A. Kharkevich and L. A. Kravchuk in the laboratory of the pharmacological division of the institute) indicated that several of the diiodomethylates exhibit high curare-like activity with a short duration of action.

121. Vitamins and Experimental Atherosclerosis

"Effect of Vitamins P and C on the Development of Experimental Atherosclerosis," by V. S. Smolenskiy, N. N. Yerofeyeva, N. F. Pankratova, M. N. Zaprometov, V sb.: Vitamin. Resursy i ikh Ispol'zovaniye (Vitamin Resources and Their Utilization), 4, M., Academy of Sciences USSR (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 16, 25 Aug 60, Abstract No 22421)

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"In experiments on rabbits, the anticholesterinemic action of vitamins P (catechin preparation from tea leaves) and C which were simultaneously administered in doses of 100 milligrams daily on the basis of 0.2 gram per kilogram of body weight was studied. The average cholesterine content in the animals which received vitamin C only was equal to 545 milligram percent; in the rabbits which were administered both vitamins, 360 milligram per cent. No essential difference in the development of atheromatosis in the rabbits of both groups was noted; however, it was expressed somewhat to a lesser degree in the animals which received both vitamins than in those which received vitamin C only."

122. Hungarians Study Deconditioning Effect of Sedatives and Tranquilizers

"Differentiation of the Deconditioning Effect of Sedato-Hypnotic and Tranquilizing Drugs," by Jozsef Knoll, Candidate of Medical Sciences, and Berta Knoll, Institute of Pharmacology, Budapest Medical University; Budapest, A Magyar Tudomanyos Akademia Biologiai es Orvosi Tudomanyok Osztalyanak Kozlemenyei, Vol XI, No 1, 1960, pp 145-153

Authors have demonstrated that by using the jump test, with 60-volt alternating current as a positive stimulus, a conditioned reflex can be established in rats which responds to the effects of both barbiturates and "major" tranquilizers such as reserpine and largactil. When 110-volt current is used, the conditioned reflex is affected only if the "major" tranquilizers are used. "This effect is suitable for selective investigation [of tranquilizers?]."

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There was no evidence of a deconditioning effect in either of the tests when "minor" such tranquilizers as meprobamate and azacyclonol were used. The authors also demonstrated that no deconditioning effects were evoked by subliminal doses: 0.25 mg/kg in the case of reserpine, 0.5 mg/kg in the case of tetrabenazine, and 1.0 mg/kg in the case of largactil. Maximum effect doses were one mg/kg in the case of reserpine, 3 mg/kg in the case of tetrabenazine, and 5 mg/kg in the case of largactil. Doses of 30-60 mg/kg of phenobarbitol were used. Doses of meprobamate as high as 100-150 mg/kg failed to inhibit the conditioned reflex.

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123. Electroencephaloscope and Computer Combination to be Used for Brain Research

"Mathematics of the Brain" (unsigned article); Moscow, Ekonomicheskaya Gazeta, 17 Sep 60, p 4

"The Soviet electroencephaloscope--a unique telivisor of the brain--until quite recently was a new word in science and engineering. A step has now been made. Scientific thought has advanced still further. On 16 September, one of the creators of the electroencephaloscope, Prof M. N. Livanov, reported at a meeting of the Presidium of the Academy of Sciences USSR on further advances in the development of electrophysiology.

"To make a detailed analysis of the momentary displays of the electroencephaloscope, he said, would require almost an entire human lifetime. Now this can be done rapidly and precisely by a computer. The combination of two such 'intelligent' devices creates the previously unforeseen possibility of understanding processes occurring in the brain and of explaining various disorders.

"It should be kept in mind that electroencephaloscopic engineering is advancing very rapidly. While the first Soviet device had 50 channels, or, in other words, could record 50 points of brain activity, the subsequent version has already been extended to 100 points, and there is prospect of a 400-channel device.

"The problem now is to create a link which will directly connect the electroencephaloscope to the computer. It will then be especially interesting and important to determine the laws governing the interrelationships of the biocurrents in the brain involved in the process of conditioned reflex elaboration.

"Professor Livanov showed the meeting participants individual recordings which indicate the progress Soviet physiology is making in this direction.

"The scientist's report evoked lively interest.

"In the resolution of the Presidium it was noted that the first attempt of the laboratory of the Institute of Higher Nervous Activity to utilize computers in electrophysiology had revealed basically new possibilities for understanding the structure and mechanism of central nervous system activity. These methods, the resolution states, may prove to be extremely useful for research in the fields of space medicine and aerophysiology and for diagnosis and therapy in the neuropsychiatric clinic, etc."

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124. Effect of Low Temperatures on Active Cholinoreceptor Centers

"Active Cholinorecceptor Centers and Changes in Their Properties With Cooling," by T. M. Turpayev, Institute of Animal Morphology imeni A. N. Severtsov, Academy of Sciences USSR; Moscow, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenov, No 9, Sep 60, pp 1056-1063

Data obtained in this investigation indicate that the cholinoreceptor of the cardiac muscle of the heart contains one or two active centers which react with a molecule of acetylcholine. With cooling, the affinity of the receptor to acetylcholine as well as the number of receptors participating in the reaction decreases. Apparently with cooling, such a change occurs in the configuration of the protein molecule of the cholinoreceptor that it leads in the beginning to a decrease in the affinity of the active center to acetylcholine and with more cooling to the complete inactivation of the active center. This is in agreement with observations made by the author and others on structural changes produced by cooling in the protein molecule of the cholinoreceptor which was discovered while changing the reaction capacity of SH-groups of the cholinoreceptors of the cardiac muscle of the frog at temperatures of 0-1°.

125. Unilateral Decortication and Ca Metabolism in Central Nervous System

"The Effect of Unilateral Decortication on Calcium Metabolism in the Central Nervous System," by B. B. Bokhov, Chair of Normal Physiology, Moscow Medical Institute imeni N. I. Pirogov; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, No 8, Aug 60, pp 89-92

Although for many years (1934-1958) E. A. Asratyan's laboratory has been engaged in studying the effect of decortication on the changes which occur in the general functions of an organism, it was deemed appropriate to study some of the chemical changes which occur in the nervous structures. The purpose of this investigation, therefore, was to study the effect of unilateral decortication and trepanation on calcium metabolism in the diencephalon, medulla oblongata, cerebellum, and spinal cord with the aid of radiocalcium. As a result of the investigations conducted, it can be stated that unilateral extirpation of the cortex led to an increase in the accumulation of Ca^{45} in the underlying segments of the central nervous system with a preponderance of accumulation occurring at the site of operation. With trepanation, no statistically authentic variances were apparent.

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126. Noise Control Efforts Coordinated

"The Coordination of Research Work on the Problem of Noise Control," by Candidate of Medical Sciences S. I. Murovannaya, Institute of General and Communal Hygiene imeni A. N. Sysin, Academy of Medical Sciences USSR; Moscow, Gigiyena i Sanitariya, No 9, Sep 60, pp 15-21

This article states that the results of investigations of the effect of the noise present in various industrial establishments, on streets, and in residential areas on the human organism as a whole indicated the need for coordinated effort in noise control. Results of research performed in the past few years by T. A. Orlova, K. Shreder and others showed that noise causes changes in the higher nervous activity and produces pathological shifts in living organisms long before their hearing is affected in any way. It has also been recognized that the incidence of disorders in the cardiovascular system is very high among the population of the Soviet Union. The Ministry of Health USSR, therefore, decided to bring the problem of noise control to the attention of physiologists, clinical physicians, and hygiene and sanitation specialists.

An all-union conference called by the Ministry of Health USSR was consequently held 26-29 November 1957. It was decided at the conference to organize a permanent committee on noise control within the framework of the Main State Sanitary Inspection of the USSR. This committee began its work during the second half of 1958. It has established liaison with the following Problem Commissions of the Presidium of the Academy of Medical Sciences USSR: Problem Commission No 1, "The Physiology and Pathology of Higher Nervous Activity; Problem Commission No 2, "Basic Physiological Functions and Their Neural and Humoral Regulation; and Problem Commission No 44, "Hypertension, Atherosclerosis, and Coronary Insufficiency." As a result, a number of institutes of clinical medicine and chairs of physiology have incorporated in their research work such problems as the study of the effect of noise on the cardiovascular and other systems of a living organism.

Considerable progress has been made in scientific research during 1959 and so far in 1960. More is expected to be accomplished as closer cooperation is established with a few more institutes, physicists specializing in acoustics, construction engineers, machine designers, architects, and specialists in other fields. Liaison is also being planned with the Institute of Acoustics, Academy of Sciences USSR.

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127. Industrial Noise Standards Evaluated

"A Physiological Background for Determining Industrial Noise Standards," by Candidate of Medical Sciences A. A. Arkad'yevskiy, Moscow Scientific Research Institute of Hygiene and Sanitation imeni F. F. Erisman, Ministry of Health RSFSR; Moscow, Gigiyena i Sanitariya, No 9, Sep 60, pp 21-26

The results of studies conducted on young people with normal hearing and average health showed that industrial noise of low frequency and intensities between 80 and 100 decibels affects all functions of the human organism. Sufficient evidence was collected to prove that noise of low frequency and intensity of 100 decibels produces a considerable disturbance in the functions of the human organism and that restoration of these functions is delayed for a long period. It was noted that shifts in the same functions of the human organism caused by noise of the same low frequency, but of an intensity between 80 and 90 decibels were insignificant and they were restored within a short period.

Functional shifts in the human organism were observed by means of audiometric and electrocardiographic recording; the length of the latent period in the visuo-motor reaction was measured and arterial blood pressure was taken.

128. Noise Effects During Workday Studied

"The Effect of Intensive Noise on the Functional Condition of the Nervous System," by L. Ye. Milkov, Neurology Department of Clinic of Institute of Industrial Hygiene and Occupational Diseases, Academy of Medical Sciences USSR; Moscow, Gigiyena i Sanitariya, No 9, Sep 60, pp 26-31

The results of investigations conducted to determine the effect of noise of high frequency and intensities of 95-120 decibels on people employed in industrial establishments where such noise is prevalent are presented in this article; these results showed that noise causes functional disturbances in the central nervous system. These disturbances were found to manifest themselves by an asthenic and neurotic reaction, an astheno-autonomic syndrome, or vasculo-autonomic disfunction. The asthenic and neurotic symptoms were usually observed in conjunction with changes in the auditory analysor. The extent of manifestation of these disturbances increased with an increase in the intensity of the noise and the length of service under such conditions.

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The use of an electric olfactometer and a pallesthesiometer made it possible to reveal an increase of the absolute auditory threshold in the course of the workday and a decrease in the differentiating capacity of the vibratory analysor toward the end of the working day. During the day, there occurred a definite lengthening of the latent period in the motor reaction to light and sound signals.

The above-mentioned shifts in the function of the central nervous system are probably connected with symptoms of fatigue.

This clinical picture of "noise sickness" is especially significant in medical evaluation of work capacity and in the development of therapeutic and preventive measures. The fact that the effect of noise on hearing has been more thoroughly investigated than its effect on the entire human organism explains the growing interest, in the past few years, in the study of the effects of noise on the human organism as a whole.

129. Central Nervous System Disturbance Caused by Noise in Nail-Producing Industry

"Data From Clinical and Physiological Examinations of Persons Exposed to the Prolonged Effect of Noise," by M. L. Khaymovich, Chair of Industrial Hygiene With Clinic of Occupational Diseases, Leningrad Sanitary Hygiene Medical Institute; Moscow, Gigiyena i Sanitariya, No 9, Sep 60, pp 32-35

This article says that the results of careful medical examination of a group of workers engaged in nail production for periods of several months to 24 years showed that the majority of those exposed to noise of high frequency and intensities of 97-102 decibels had functional disorders of the central nervous system. The workers examined were between 20 and 40 years of age. The functional disorders noted were manifested in the form of asthenic and astheno-neurotic syndromes and autonomic disfunction, and also consisted a considerable lengthening of the latent period in the conditioned motor reaction to light, prolonged optic chronaxy, and disturbed thermoregulating reflexes. Pathological shifts in the function of the central nervous system occurred in the workers under observation long before the onset of any change in auditory sensitivity was noted. An increase in the incidence of pathological changes was noted in people who had worked longest in the nail-producing industry. This makes apparent the need for special measures for improving working conditions in the nail production industry.

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130. Effect of Exercise on Central Nervous System Studied

"Complex Electrophysiological Study of the Influence of Physical Exercise on the Functional State of the Central Nervous System," by G. I. Mil'shteyn; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti, Vol 10, No 4, Jul/Aug 60, pp 505-511

This article presents the results of experiments on ten healthy men between 18 and 26 years of age, which showed that intensive work on a veloergometer as a rule produced no significant electrographic changes reflecting the functional condition of the central nervous system. On the other hand, the performance of such work by a man wearing a gas mask which supplied a current of 30 liters of air per minute created a resistance to respiration equal to between 20 and 25 millimeters of water at inhalation, and between 10 and 12 millimeters of water at exhalation; this caused the disappearance of the conditioned electrocardiogram and electroencephalogram reactions and produced an increase in the period of muscular reaction and disinhibition of the electroencephalogram reaction to external stimuli (light, sound).

The author of this article thinks that it is possible to utilize the complex electrographic method to determine the effect of great physical stress on the functional state of the central nervous system.

131. Conditioned Reflexes Following Hypothermia

"Restoration of Conditioned Reflexes in Dogs After [illegible] Hypothermia," by Ye. K. Aganyants and V. F. Novikov, Chair[illegible] of Normal Physiology, Kuban' Medical Institute; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti, Vol 10, No 4, Jul/Aug 60, pp 569-574

This article reports the results of the authors' experiments on four dogs, which showed that complete restoration of secretory alimentary and protective respiratory conditioned reflexes took place after their bodies were subjected to an abnormally low temperature. Their rectal temperature was down to 24°C. It was noted that the process of restoration of conditioned respiratory reflexes began at temperatures of 31-35°C and ended on the second day after hypothermia was induced. Restoration of alimentary conditioned reflexes began at 36°C during the first 24 hours after hypothermia in young dogs; in older dogs, it took place on the third day. Complete restoration of secretory alimentary conditioned reflexes was observed 4-9 days after hypothermia. Internal inhibition was considerably weakened after hypthermia; it was restored later than the process of excitation.

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132. Elimination of Radioactive Isotopes From the Organism

"Analysis of the Effectiveness of Complex-Forming Substances Which Hasten the Elimination of Radioactive Isotopes From the Organism," by G. Ye. Fradkin and V. F. Ushakova; Moscow, Khimicheskaya Zashchita Organizma ot Ioniziruyushchikh Izlucheniy (Chemical Protection of the Organism From Ionizing Radiation), Atomizdat, 1960, pp 136-151

Investigations which have been conducted for a number of years established that certain complex-forming substances, mainly ethylenediaminotetraacetic acid, by forming stable compounds with radioactive isotopes hasten the elimination of these isotopes from the organism. Y^{91} and Pu^{239} were used in the investigations. It was established that cyclohexanediaminotetraacetic and cyclopentanediaminotetraacetic acids are the more effective of the complex-forming substance in the formation of stable compounds with radioactive isotopes; these compounds are readily eliminated by the organism. They may be dependably used as first-aid means in cases of acute affections by radioactive isotopes.

133. Protection of Organism From Effects of Radiation

"Relationship Between the Structure and Properties of Sulfur-Containing Compounds and Their Protective Action From Penetrating Radiation," by V. G. Yakovlev; Moscow, Khimicheskaya Zashchita Organizma ot Ioniziruyushchikh Izlucheniy (Chemical Protection of the Organism From Ionizing Radiation), Atomizdat, 1960, pp 14-40

Report on the results of the investigations which were carried out to determine the effectiveness of low-molecular compounds containing free thiol (SH-) groups or capable of freeing these groups in living tissue as a result of chemical interaction with biosubstrates is given. Rats were used in the experiments, which established that oxy- and keto derivatives of mercaptopropionic acid are not effective when used to protect the organism from the effects of radiation; the protective action of SH-glutathione to a considerable degree depends on the composition of its salts: twice as many rats survived the effects of radiation when lithium salts were used as when sodium salts were applied; the complex esters of l-cysteine with aliphatic alcohols of C_1-C_5 series were found to possess a high protective action, this action depending on the structure of the carbon chains, composition, and solubility of the salts in water and organic solvents; sodium nitrite and adenosine triphosphate did not potentiate the protective properties of the n-propyl ester of l-cysteine.

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The investigations established that the protective action of the thiol substances, when used for the chemical protection of the organism from the effects of ionizing radiation, depends on their chemical structure, the presence of additional functional groups in the molecule, and the disposition of these groups in the molecule.

134. Theories of Mechanism of Chemical Protection From Effects of Radiation

"Contemporary State of Chemical Protection From Penetrating Radiation," by V. S. Balabukha; Moscow, Khimicheskaya Zashchita Organizma ot Ioniziruyushchikh Izlucheniy (Chemical Protection of the Organism From Ionizing Radiation), Atomizdat, 1960, pp 7-14

The article briefly reviews the literary data which report the results of investigations conducted to determine the mechanism of the action of some chemical substances used for the protection of the organism from the effects of ionizing radiation. Five theories are presented and discussed. They are as follows:

1. It was definitely established that oxidation processes which are induced by oxidizing radicals formed in the aqueous phases of the organism under the influence of radiation play an important role in the primary processes of radiation affection. It is the opinion of a number of authors that a protective effect can be obtained by the introduction into the organism of certain chemicals which can create a condition of hypoxia in the organism, thus decreasing the possibility of the formation of the oxidizing radicals.

2. Other researchers advance the theory that the basis of the mechanism of the chemical protection of the organism from the effects of radiation is due to the capacity of the chemicals to absorb the oxidizing radicals, forming substances which protect the biosubstrates from the harmful effects of the oxidizing radicals.

3. A theory has been advanced that the protective action of some chemicals -- aminothiols -- is due to their capacity to form temporary compounds with the thiol groups of the proteins and enzymes, protecting the biomolecules from the harmful effects of radiation.

4. The protective action of some chemicals, according to another theory, is due to their capacity to form temporary disulfides which absorb the radiation energy, carry it along the carbon chain of the protein molecule, and diffuse the energy in the ionized part of the molecule protein.

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5. Finally, the hypothesis is being advanced of the possibility of the absorption of the ultraviolet spectrum by chemical compounds which are formed in the organism.

Various experimental data are cited. None are conclusive, according to the author, but merit the attention of the research workers in the field of the chemical protection of the organism from the effects of penetrating radiation.

135. Review of Volume on Protection of Organism from Effects of Radiation

"Khimicheskaya Zashchita Organizma ot Ioniziruyushchikh Izlucheniy (Chemical Protection of the Organism From Ionizing Radiation)," edited by V. S. Balabukha; Moscow, Atomizdat, 1960, pp 1-151

The volume consists of a table of contents (attached), an introduction in which the author outlines the purpose of the book, and two sections. The first section deals with the problem of the chemical protection of the organism from penetrating radiation. A brief analysis is given of the contemporary state of the problem, data obtained in experiments are cited, and the theories of the mechanism of the protective action of some chemicals (aminothiols and pyrimidine derivatives) are examined.

The second section deals with the problem of the elimination of radioactive isotopes from the organism. The effectiveness of certain chemicals which, when introduced into the organism, have the capacity to form with the isotopes stable compounds which would be readily eliminated from the organism is examined.

The volume is intended for chemists, biologists, and other specialists who are studying the problems of radiobiology. The table of contents follows.

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136. Preparations for Second All-Union Conference on Medical Radiology

"Concerning the Preparation for the Convocation of the Second All-Union Conference on Medical Radiology" (unsigned article); Moscow, Meditsinskaya Radiologiya, Vol 5, No 8, Aug 60, p 95

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"To prepare summaries of scientific research on medical radiology, introduce modern scientific accomplishments into public health practice, and exchange experience of the best radiological institutes, the Ministry of Health USSR has decided to hold a second All-Union Conference on Medical Radiology, which will take place during the first half of 1961."

The following is a summary of the problems which have been proposed for discussion at the conference:

A. Clinical Radiology

1. The diagnostic use of radioactive substances in the differential diagnosis of malignant tumors, and the use of radioactive substances in surgery, gynecology, and in the clinic of internal diseases.

2. The therapeutic use of artificial radioactive substances in treating cancer of the lungs, esophagus, mammary gland, urinary bladder, and the uterus; the combined method of therapy (radiation therapy plus surgical intervention, and radiation therapy plus chemotherapy or hormone therapy).

3. Theoretical characteristics of radiation therapy.

B. Radiobiology

1. Initial processes of the biological action of ionizing radiation.

2. Various sequelae of the biological action of nuclear radiations.

3. The characteristics of the reaction of the irradiated organism to the effect of stimulants.

4. Immunobiological reactions in radiation pathology.

5. The reactions of an organism to chronic radiation action.

6. Therapy and prophylaxis of radiation injuries under experimental conditions.

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C. Problems of Organization and Methodology

1. The status of and prospects for the development of radiological aid to the population.

2. The status, registration, and qualifications of radiological personnel.

3. Problems of radiological publications.

D. Dosimetry

1. Fundamental problems of dosimetry and the essential trends in its development.

2. Dosimetry of external and internal latent (concealed) sources of radioactive radiation.

3. Dosimetry of incorporated radioactive substances in therapeuto-diagnostic and experimental usage.

4. Calorimetric determinations.

5. Chemical dosimetry.

6. Counting methods of dosimetry.

7. Dosimetric instruments.

8. Clinical dosimetry. The organization of dosimetry in the clinic. The bond between scientific research and development and the practical demands of clinical dosimetry.

E. Physicochemical Equipment

1. Sources of ionizing radiations.

2. Radiodiagnostic apparatus.

3. Shielding from ionizing radiations at the clinic. Apparatus for the control of shielding.

F. Problems of Organization (Planning and Coordination) of Scientific Research Work on Clinical Radiology and Radiobiology.

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137. Medical Research in 1959 at Charles University

"Evaluation of Scientific Research Activity in 1959"; Prague, Sbornik Lekarsky, Vol 62, No 6, Jun 60, p 184

In the final evaluation of the scientific research activity of the Faculty of General Medicine of Charles University in Prague for 1959, the institutes, clinics, and laboratories of the faculty submitted 551 reports on specific research tasks, with 32 being projects included in the state research plan and 296 in the research plan of the Ministry of Health and Education, and 250 projects being of an institutional (faculty) nature. The final reports were classified according to problem and turned over to 24 problem groups for qualitative evaluation.

A total of 644 projects were thus evaluated. or over 90 more than had been originally scheduled. These included 32 state, 262 sector, and 344 faculty projects. Of these, 143 were completed (3 state, 48 sector, and 92 faculty); 446 were provisionally completed (35 stste, 199 sector, and 212 faculty); and 52 (15 sector and 37 faculty) were either canceled or not completed. Of the 143 projects completed, 115 were classified in grades A, B, or C.

During 1959 the following works were published (under auspices of the faculty): 1,241 scientific lectures, 134 scientific lectures given abroad, 1,035 popular articles, 34 advanced school textbooks, 8 other textbooks, 53 scientific monographs, 1,345 scientific periodical articles, 172 brief scientific reports, 127 collective reports, 5 book translations, 2,065 book reviews and titles, 181 popular articles [sic], and 40 popular books.

138. New Medical Research Institutes

"New Research Institutes"; Prague, Ceskoslovenske Zdravotnictvi, No 5, May 60, p 251

On recommendation of the Czechoslovak Academy of Sciences, the Czechoslovak government has approved the establishment of a number of new medical research institutes and of new branches for existing institutes during the Third Five-Year Plan. These new facilities, which will be under the jurisdiction of the Ministry of Health, are to be as follows:

1. Research Institute for Pediatrics -- The existing laboratory, operating as part of the Pediatrics Faculty in Prague, will engage in research work to a greater degree, particularly following the establishment of the Pediatrics Faculty at Prague-Motole.

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2. Research Institute for Neurology and Psychiatry -- At the same time, the research laboratories operating as part of the neurological clinics in Prague and Bratislava will be better equipped and their personnel will be increased.

3. Research Institute for Experimental Therapy -- The establishment of this institute is urgent for the continuously developing pharmaceutical industry. This facility will be located in Prague.

4. A branch of the Research Institute for Balneology -- in the future to be known as the Research Institute for Physiatrics and Balneology. This facility will be located in Slovakia and will be oriented toward the conduct of bioclimatological research.

5. Branches of the Institute of Work Hygiene and Occupational Diseases are to be established in Ostrava and Pribram or Jachymov. The branch in Ostrava will be concerned with hygiene research in mines and metallurgical plants while the branch in Pribram or Jachymov will be concerned with hygiene in the extraction and preparation of radioactive raw materials.

6. The Central Isotope Work Facility is to be established in Prague-Krc.

7. The new Model Laboratory for Research Institutes in Krc will be concerned with the design of instruments for the medical profession.

8. The existing biochemical laboratory of the Oncological Institute in Brno will be converted into a branch of the Research Institute for Oncology in Bratislava.

During the Third Five-Year Plan, conditions will also be developed for the establishment of a gerontological center which will serve as the nucleus for the development of the independent Research Institute for Gerontology. The activity of the Research Institute for the Organization of Health Care will be expanded to include work on major economic problems of health.

The entire field of medical research is to strengthen its physiological and pathological aspects, and physiological laboratories are to be created at all sector research institutes.

The facilities of the children's hospital in Brno have been suggested as a temporary location for the Research Institute for Pediatrics, while the psychiatric care center in Bohnice has been suggested for use by the Research Institute for [Neurology and] Psychiatry.

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139. New Headquarters for Hungarian Pharmaceutical Industry Research Institute

Budapest, Magyar Kemikusok Lapja, Vol 15, No 8, Aug 60, p 378

The construction of the new headquarters of the Pharmaceutical Industry Research Institute had begun at Ujpest, in the vicinity of the Chinoin pharmaceutical factory. The institute will occupy an area of 4,000 hectares. During the first phase of construction, the antibiotics laboratory, together with its pilot plant, will be built and also a several-story chemical laboratory and a building for experimental animal breeding.

The new headquarters will have facilities for research in the field of antibiotics, plant chemistry, biochemistry, and organic chemistry; it will also have departments of medical science and pharmacology.

140. Hungary Regulates Employment of Physicians

Budapest, Magyar Kozlony, No 77, 1960, p 571

The Hungarian government has resolved that approval of the Ministry of Health is required in the employment of any physician who is serving with an institution or organ which is under the jurisdiction of the Ministry of Health. The Ministry of Health may decree that in megyek where there is a shortage of physicians such physicians may accept employment in another megye or in Budapest only with the approval of the health department of the executive committee of the competent megye council. New posts for physicians may be established only with the approval of the Ministry of Health.

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Magnetohydrodynamics; Plasma Physics

141. Reports of 1958 Riga Magnetohydrodynamics Conference Published

Voprosy Magnitnoy Gidrodinamiki i Dinamiki Plazmy. Trudy Konferentski Po Magnitnoy Gidrodinamike, Riga, 2-10 Iyulya 1958 g. (Probelms of Magnetohydrodynamics and Plasma Dynamics. Works of the Conference On Magnetohydrodynamics, Riga, 2-10 July 1958), Riga, 1959, 339 pp

The majority of the texts of the 55 conference reports and discussions of reports are presented in the source in abridged form. Previously published reports are included there as brief abstracts only. The material published there for the first time (abridged and unabridged) are as follows:

"The Role of Magnetohydrodynamics and Plasma Dynamics in Certain Problems of Astrophysics," by D. A. Frank-Kamenetskiy, Moscow, pp 7-11

"Magnetohydrodynamics and the Study of Variations of Cosmic Rays," by L. I. Dorman, Moscow, pp 13-44

"Cosmic Ray Spectra and Their Role in Cosmic Gas Dynamics," by S. I. Syrovatskiy, Moscow, pp 45-48

"The Influence of a Magnetic Field on the Stability of Flow of a Conducting Fluid," by Ye. P. Velikhov, Moscow, pp 49-58

"Some Problems of the Motion of a Rarefied Plasma in a Magnetic Field," by Ya. P. Terletskiy, Moscow, pp 59-62

"On Nonlinear Steady-State Motions of a Rarefied Plasma in a Magnetic Field," by R. Z. Sagdeyev, Moscow, pp 63-65

"On One Criterion of Applicability of the Equations of Magnetohydrodynamics to a Plasma," by S. I. Braginskiy, Moscow, pp 67-71 (Discussion of the report by R. V. Polovin, Khar'kov, pp 71-72)

(Pages 73 contains abstract of article, "On the Problem of Accelerating a Plasma in a Magnetic Field," by G. V. Gordeyev and A. I. Gubanov, Leningrad, which has been published in Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, 1958, p 2046; a discussion of the article by G. V. Gordeyev appears on pp 74-75.)

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"On Certain Problems in the Designing of Linear Induction Pumps," by A. I. Vol'dek, Tallin, pp 273-277; discussion of the report by L. A. Verte, Moscow, pp 277-278

"The Problem of the 'Electromagnetic Crucible," by R. P. Zheaherin, Leningrad, pp 279-294 (illustrations)

"On the Turbulent Flow of a Liquid Metal Under the Influence of a Traveling Magnetic Field," by I. M. Kirko and O. A. Liyelausis, Riga, pp 295-302

"The Use of Diffused-Field Pumps for Moving Liquid Metals," by A. E. Mikel'son, Riga, pp 305-311

"Design of the Arc Stator For Stirring the Metal in an Arc Furnace by Means of Induction," by M. G. Rezin, Sverdlovsk, pp 313-321

"Feed Circuits of Installations for the Electromagnetic Mixing of a Metal in Electric Arc Furnaces," by Ya. I. Drobinin, Sverdlovsk, pp 323-333

"On the Choice of an Optimal Stator Current Frequency for the Mixing of a Liquid Metal by Means of a Traveling Electromagnetic Field," by N. I. Bortnichuk and M. M. Krutyanskiy, Moscow, pp 337-339

142. Parallel Viscous Flow in Perpendicular Magnetic Field

"On the Stability of Flow of a Viscous Conducting Fluid Between Parallel Surfaces in a Perpendicular Magnetic Field," by K. B. Pavlov and Yu. A. Tarasov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, 1960, pp 723-725

A treatment of the problem by C. C. Line ("On the Stability of Two-Dimensional Parallel Flows," Quart. Appl. Math. 3, 1945, 1956, NN 2, 3, 4, 117-142, 218-234, 277-301) considers stability in relation to infinitely small perturbations, where the magnetic Reynolds number $R_m \ll 1$. This article treats an analogous problem for $R_m \sim 1$, including the area of high velocity and temperatures on the order of 5,000-10,000 degrees.

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143. Magnetohydrodynamic Waves

"Contribution to the Theory of Simple Magnetohydrodynamic Waves," by R. V. Polovin, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 2, Aug 60, pp 463-469

The Riemann invariants are computed for simple magnetohydrodynamic waves. The change of velocity in fast and slow magnetoacoustic waves is determined for the case when the magnetic pressure in front of the wave is much smaller than the hydrostatic pressure.

144. Magnetohydrodynamic Waves

"Build-Up of Magnetohydrodynamic Waves in a Plasma Moving Through an Ionized Gas," by V. P. Dokuchayev, Radiophysics Institute, Gor'kiy State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 2, Aug 60, pp 413-415

A dispersion equation is derived which describes the propagation of electromagnetic waves in a plasma moving through an ionized gas. The case of low frequencies (below the gyrofrequency of the ions), when the waves degenerate into magnetodynamic waves, is considered in detail. It is shown that if the velocity of the flow exceeds the Alfven wave velocity in the following and stationary plasma system, the latter becomes unstable. In this case, one of the normal waves begins to build up.

145. Plasma Stability

"Dynamic Stabilization of a Plasma Coil," by S. M. Osovets; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 2, Aug 60, pp 311-316

A method is proposed for dynamic stabilization of long-wave instabilities of a plasma coil. The stability conditions are presented, and the frequency range of the rapidly varying stabilizing magnetic fields is determined.

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146. Plasma Breakdown

"Experimental Investigation of the Diffusive Plasma Breakdown in a Magnetic Field," by V. Ye. Goland and A. P. Shilinskiy, Leningrad Polytechnic Institute imeni Kalinin; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 7, Jul 60, pp 745-755

Results of experimental investigations of decaying plasma in helium are described in conditions under which the basic decay mechanism is diffusion of charged particles across the magnetic field. For determining the electron concentration, an ultrahigh frequency method was applied. The tests were carried out at a helium pressure of 0.09-2 mm Hg and a magnetic field strength up to 1100 oerst within a concentration range of charged particles 10^8 to 10^{11} cm^{-3}.

147. Stable Plasma Pinch

"A Stable Dynamic Current Pinch," by V. I. Vasil'yev, V. S. Komelkov, Yu. V. Skvortsov, and S. S. Tserevitinov; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 7, Jul 60, pp 756-768

The formation and development of a current pinch appearing at motion of a plasma flux in deuterium, hydrogen, and argon are studied. The initial gas pressures are 10 to 10^{-2} mm Hg. Maximum discharge currents reached 500 ka. The current period varied from 20 to 300 microsec. The plasma motion was studied by means of high speed photography, magnetic probes, and spectral analysis. It has been established: (1) the high stability of the current pinch kept during a half discharge period; (2) the current distribution in a moving plasma flux; (3) the presence of a continuum in radiation appearing simultaneously in the studied region with the formation of a current pinch.

148. Plasma Behavior

"Plasma Behavior in a Variable Magnetic Field," by I. M. Zolototrubov, N. M. Ryzhov, I. P. Skoblik, and V. T. Tolok, Physicotechnical Institute, Academy of Sciences Ukrainian SSR, Kharkov; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 7, Jul 60, pp 769-773

Experimental study was carried out of an electronless gas discharge in a magnetic field of two single-winding coils which received the discharge of a capacitor battery. The discharge was formed by eddy currents appearing during variation of the magnetic flux in time. The thus formed discharge

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plasma was submitted to the reaction of the simusoidal magnetic field, whose presence leads to plasma pinch in a direction radial to the system axis, as well as in an axial direction to the middle of the coil gap. The compressing hydrogen plasma exhibited radial oscillations.

149. Plasma Stability

"Stability of a Thin Ring-Shaped Plasma Conductor in a Magnetic Field," by Yu. V. Vandakurov, Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 7, Jul 60, pp 781-789

Analysis is carried out of stability of a thin ring-shaped plasma pinch with a surface current with respect to long-wave perturbations in magnetohydrodynamic approximation, the wave length being comparable to the pinch length. The absence of an ideally conducting sheathing is assumed, and the external longitudinal field is missing or negligible.

150. Nonlinear Plasma Oscillations

"Nonlinear Theory of Electron-Ion Plasma Oscillations," by F. M. Nekrasov, Kharkov State University imeni Gorkiy; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 7, Jul 60, pp 774-780

The kinetic equation without accounting for the collision integral in nonlinear approximation is used for analysis of stationary electron-ion plasma oscillations. It is shown that oscillations of density charge in plasma without a relatively directed motion of electron and ion components are basically due to electrons. The ion component is of dominant importance in oscillations only in the presence of relative motion. The relation of the period of oscillations to the amplitude is determined, as well as the maximum fields rendering stationary waves in plasma possible.

151. Plasmafilled Waveguide

"Slow Waves in a Spiral Plasma Filled Wave Guide," by B. M. Bulgakov, V. P. Shestopalov, L. A. Shishkin, and I. P. Yakimenko, Kharkov State University imeni Gorkiy; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 7, Jul 60, pp 840-850

The dispersion equation of a spiral wound on a dielectric tube filled with plasma was derived and analyzed. A constant magnetic field was applied along the system axis.

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152. Standing Waves in Plasma

"Theory of Standing Wave Excitation in Plasma, " by R. Leven, Chair of General Physics; Moscow, Vestnik Moskovskogo Universiteta, Seriya III, Fizika, Astronomiya, No 4, Jul/Aug 60, pp 32-37

A dispersion equation for standing waves in a limited plasma was derived. This enables one obtain the values of frequencies and increments at arbitrary relations of beam density and plasma without the use of computing machines. The results are compared with other experimental and theoretical data.

153. Instability of Plasma

"The Instability of a Plasma With an Anisotropic Distribution of Velocities in a Magnetic Field," by R. Z. Sagdeyev and V. D. Shafranov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 7, Jul 60, pp 181-184

It is shown that even at a weak temperature anisotrophy $|T_\perp - T_\parallel| / T \ll 1$ a plasma in a uniform magnetic field is unstable. The instability is due to those charges in the "tail" of the velocity distribution which are in cyclotron resonance with the perturbation wave.

154. Properties of Xenon and Argon Plasma

"Investigations of Some Characteristics of Xenon and Argon Plasma Behind a Strong Shock Wave," by S. R. Kholev, Moscow State University imeni Lomonosov; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 4, 1960, pp 30-39

Results of spectral analysis of gas glowing in a shock tube behind a strong (up to M = 35) shock wave in xenon are described and compared with the temperature height (up to 24000°K) behind the shock wave, reflected from a plane wall with a velocity computed incident shock wave, as well as with the temperature measured at reflection from the descending angle near its summit.

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155. Magnetic Trap

A Magnetic Trap With Rotating Plugs," by L. I. Rudakov; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 8, Aug 60, pp 907-912

If high amplitude electromagnetic oscillations are excited in a plasma, filling a trap with static magnetic plugs, then an additional force will act on the plasma particles in the region of the plugs, counteracting the exist of particles from the trap. It is shown that in this way the conical exit of particles may be shut.

156. Magneto-Sonic Resonance

"Magneto-Sonic Resonance in Plasma," by D. A. Frank-Kamenetskiy; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 8, Aug 60, pp 899-906

A method of plasma heating on account of the high frequency electromagnetic field was suggested, in conditions when a strong connection between oscillator and plasma is secured by the conditon of magneto-sonic resonance. Several types of plasma resonances were analyzed with a subdivision on swing resonance and absorption resonance, and an evaluation of the possible value of various types of resonances for plasma heating was given.

157. Magnetic Sound

"Magnetic Sound in Three Component Plasma," by D. A. Frank-Kamenetskiy; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 8, Aug 60, pp 893-898

Formulas were derived, in simple approximation, expressing the effect of neutral particles on magneto-sonar plasma oscillations. At high frequencies, the neutral gas is not drifted, but at low frequencies, it is fully drifted by the plasma oscillations. At partial drifting, the recharged collisions lead to an additional attenuation. The effect of collisions on the penetration of the temporary field into the plasma in presence and absence of a strong static magnetic field has a contradictory character (skin and space attenuation).

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158. Particle Diffusion in Plasma

"The Diffusion of Charged Particles Across the Magnetic Field in a Three Component Plasma," by V. Ye. Golant, Physicotechnical Institute, Academy of Sciences USSR, Leningrad; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 8, Aug 60, pp 881-892

The motion of charged particles under action of gradients of concentration and temperature in plasma, consisting of electrons, ions, and neutral atoms, was analyzed. Expressions were derived determining the electron and ion flow across the magnetic field.

159. Atom Concentration in Plasma

"Concentration of Atoms in Arc Plasma as Determined by the Pulse Absorption Method," by L. D. Kondrasheva and I. V. Podmoshenskiy; Leningrad, Optika i Spektroskopiya, Vol 9, No 3, Sep 60, pp 281-287

A pulse method permitting practically instantaneous showing of a plasma absorption spectrum at 6000°K is described. A direct current plasma in air between two vertical metallic electrodes was tested. It was found that in a Fe-Cu arc, the volume occupied by excited atoms on a level of about 3 ev takes about 30% of the volume taken by normal atoms. Instantaneous concentration values of Fe, Cr, and Mn were established.

160. High-Frequency Discharge

"Investigation of a High-Frequency Discharge With Hydrodynamic Compression," by Zh. Zheyenbayev; Leningrad, Optika i Spektroskopiya, Vol 9, No 3, Sep 60, pp 288-294

Temperature characteristics of a high-frequency discharge with hydrodynamic compression were investigated. The results of temperature studies were presented in their relation to various discharge factors, as well as the variations of spectral line intensities in relation to the mode of the discharge burning. The discharge temperatures were measured from iron and copper lines, equaling about 6800°K.

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161. Stability of Steady Motions of Gyroscope Frame

"On the Stability of the Steady Motions of a Gyroscope Frame," by V. N. Skimel', Kazan'; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, 1960, pp 760-762

The frame, fastened at one point around which it can rotate as desired, holds two gyroscopes, the housings of which may be rotated in relation to the frame around parallel axes at equal angles and are connected by a spring. The center of gravity of the system does not coincide with the point at which the frame is attached; thus the system is similar to the gyrosphere of a space compass. This article considers the question of the existence of stationary motions of such a system and of their stability. The mass of the frame is taken into account, and the gyroscopes are not assumed to be "fast" in the sense of elementary theory. The natural angular velocities of the gyroscopes are assumed to be different. The motion is influenced by only one external force, gravity. The system is assumed to be conservative and is considered in the inertial axes.

162. Instability of the Figure Axis of a Gyroscope

"On the Instability of the Figure Axis of a Gyroscope," by Ya. L. Lunts, Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, 1960, pp 763-765

Utilizing the first integrals of the equations of motion of a gyroscope with gimbal suspension, the author establishes the fact that no matter how small the perturbations of the inner frame may be, they will produce a precession of the outer frame which will move the rotor of the gyroscope out of its original position.

163. Passive and Active Gyrostabilizers for Ship or Aircraft Platforms

"On the Theory of Spontaneous Gyroscopic Stabilizers," by Ya. N. Roytenberg, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, 1960, pp 766-770

An analysis is made of the motions of spontaneous gyroscopic stabilizers of the passive and active type for an irregular rolling and pitching of a ship, and an estimate is made of the precision of stabilization, under the assumption that the rolling and pitching motion is a stationary random process.

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Values obtained for the root mean square deviation of the angle of stabilization and of the angle of shift with approximate formulas given in the text are in satisfactory agreement with corresponding values obtained with exact formulas. The approximate formulas also afford the possibility of estimating the influence of other parameters. The superiority of the active type of gyrostabilizer over the passive type with respect to guaranteed precision of stabilization is clearly demonstrated.

164. Astatic Gyro in Cardan Suspension With Dry Friction

"On the Motion of an Astatic Gyroscope in Cardan Suspension With Dry Friction," by D. M. Klimov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, 1960, pp 771-776

Ye. L. Nikolai (DAN SSSR, Vol 38, No 2-3, 1943; Gidroskop v Kardanovom Podvece /The Gyroscope in Cardan Suspension/, Moscow, 1944) treated the problem of the motion of a balanced gyroscope in Cardan suspension, taking into account the influence of constant friction moments on the suspension axes. This article reports on a study of the motion of an astatic gyroscope in Cardan suspension on an immobile base, assuming that friction forces exerted on the suspension axes are proportional to the normal components of the dynamic reactions. Some of the results of this study have already been published by the author (DAN SSSR, Vol 123, No 3, 1958); the discussion here treats the derivation of the equations of motion, the motion of the gyroscope under the effect of a constant moment, and the motion of a gyroscope with weight.

165. Special Problems of the Thermodynamics of Continuous Media

"On Certain Special Problems of the Thermodynamics of Continuous Media," by S. S. Grigoryan, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, 1960, pp 651-662

Once a thermodynamic model of a certain medium has been constructed for reversible processes not accompanied by macroscopic motion, it is necessary, in formulating a system of equations to describe the motion of the medium, to generalize the thermodynamics of the medium for processes which occur in the presence of such motions, particularly those complicated by dissipative (irreversible) factors. Here the question arise, is it possible to apply the principles of thermodynamics for the case of these motions as for the case of reversible processes and a state of rest or must essential changes be made. The possibility of applying thermodynamics without change should be investigated for each concrete case.

These questions are treated here, since they are not known to have been analyzed in the literature, and are met in practice, particularly in the mechanics pf solid deformed media.

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166. Diffraction of Shock Waves

"On the Theory of the Diffraction of Shock Waves," by K. A. Bezhanov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, 1960, pp 718-722

This work considers the diffraction of shock waves along a rectilinear wall forming a small angle with the direction of the motion of the front of the shock wave. The treatment of this problem by Lighthill ("The Diffraction of Blast," Proc. Roy. Soc., 1949, A 198) leads to the Riemann-Hilbert edge problem which is solved by the method of trial and error. This article gives a different solution, which is shown to be not unique, since the solution of the problem with discontinuous coefficients depends on special limitations at the points of discontinuation of the coefficients of the edge conditions.

167. Rotational Stability of Heavy Solid Body With Liquid-Filled Cavity

"On the Stability of Rotation of a Gyroscope With a Cavity Filled With a Viscous Liquid," by V. V. Rumyantsev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, 1960, pp 603-609

Earlier works by the author (Prikladnaya Matematika i Mekhanika, Vol 23, No 6, 1959; ibid, Vol 24, No 1, 1960) stated and solved the problem of the stability of the relative motion of the rotary motions of a symmetrical solid body with a cavity completely or partially filled with an ideal liquid in relation to the parameters characterizing the motion of the solid body and in relation to the projections of the moment of the motions of the liquid.

This article solves an analogous case, the problem of the stability of motion of a nonsymmetrical heavy solid body with one fixed point having a cavity of arbitrary form completely filled with a viscous liquid. Sufficient conditions of stability of rotation around the vertical of the solid body, together with the liquid, are found by using the second method of Lyapunov.

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168. Reflection of Spherical Waves From Free Surface of Elastic Half-Space

"Reflection of One-Dimensional Spherical Waves From the Free Surface of an Elastic Half-Space Having No Resistance to Shear," by O. Kh. M. Aliyev; Baku, Izvestiya Adademii Nauk Azerbaydzhanskoy SSR, Seriya Fiziko-Matematicheskikh i Tekhnicheskikh Nauk, No 2 1960, pp 35-47

A study is made of the propagation and reflection from the free surface of a half-plane of one-dimensional spherical waves resulting from the application of an impact pressure within an elastic medium. An analysis of the obtained results makes possible the explanation of conditions under which tensile stresses, which cause cleavage, can occur and provides a qualitative picture of the process of cleavage.

169. Book on Hypersonic Gas Flow

Techeniya Gaza c Bol'shoy Sverkhzvukovoy Skorost'yu (The Flow of a Gas at High Supersonic Velocity), by G. G. Chernyy, Moscow, Fizmatgiz, 1959, 220 pp

The text is based on a special series of lectures delivered in 1954-1956 by the author at the Mechanics-Mathematics Faculty of Moscow State University, supplemented by more recent work on problems considered in the lectures. The first two chapters treat the general case of hypersonic flow around a body and the particular case of hypersonic flow around thin bodies. The special section of the book (chapters III-V) includes only those areas of the theory of flow of an ideal gas at hypersonic velocities in which the author has done work. The book thus fails to discuss the important question of the flow of a gas in the vicinity of a blunt-nosed body in the presence of a subsonic zone, for which the author recommends reading Van Dyke, "The Supersonic Blunt-Body Problem" (Journ. Aeron. Sci., 25, 8, 1958).

The author also omits the influence of discrepancies of the properties of air in treating the properties of an ideal gas with constant thermal capacity, assuming that the problem is not of particular difficulty, since the procedure given in chapters III and IV can readily be generalized for such conditions.

This book also fails to discuss the influence of viscosity on the hypersonic flow of a gas, and the reading of L. Lees, "Recent Developments in Hypersonic Flow," (Jet Propulsion, 27, 11, 1957) and Hayes and Probstein, Hypersonic Flow Theory, Academic Press, 1959, is recommended.

A 199-item bibliography is appended.

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170. Heat Distribution in Cone Investigated

"Concerning the Distribution of Heat in a Cone," by N. N. Gvozdkov, Moscow State University imeni M. V. Lomonosov; Moscow, Nauchnyye Doklady Vysshey Shkoly, Fiziko-Matematicheskiye Nauki, No 3, Apr 60, pp 14-21

The problems concerning determination of the temperature field in a heated solid cone are considered in the present work. Such problems may have value during the consideration of heat processes of conical bodies in high-speed dynamic gas flow. Kh.-S. Karslou, in his work Teoriya teploprovodnosti (Theory of Heat Conductivity), OGIZ, 1947, solved the problem concerning the temperature field of a cone having a given initial distribution of internal temperature and uniform boundary conditions.

Two problems are solved in the present work. In the first problem, the heating of a cone along its lateral surface is considered when heat emission is absent on its base. The stationary temperature field in a cone is considered in the second problem when the heating on the lateral surface is compensated by the heat emissions through the base. The solutions of both problems are constructed in spherical coordinates r, θ where the spherical surface r=1 is understood as the base.

171. Analysis of Gyroscope Motion

"Motion of a Gyroscope in a Cardan Joint Mounted on a Mobile Platform," by Ya. L. Lunts, Leningrad Red Banner Air Force Academy imeni Mozhayskiy; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, Vol 3, No 4, 1960, pp 37-42

Equations of motion for a gyroscope mounted on a mobile platform are derived. A solution is given for a general case of small oscillations of the platform of a multifrequency character.

172. Gyro Latitude Compass

"A Gyro Latitude Compass With an Indirect Correction," by M. M. Bogdanovich and P. A. Il'in, Leningrad Institute of Precision Mechanics and Optics; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, Vol 3, No 4, 1960, pp 43-47

The principles of operation and of the theory of gyroscopic equipment intended for simultaneous determination of the plane of the real meridian and of the geographic latitude of the location are described.

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Nuclear Physics

173. Electrons of Superheavy Elements

"Electron Levels of Atoms of Superheavy Elements," by V. V. Voronkov and N. N. Kolesnikov, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 7, Jul 60, pp 189-191

The behavior of electron ns-levels in the field of finite size nuclei with $Z > 137$ in considered near $\mathcal{E} \sim -m$ and $\mathcal{E} \sim +m$ on basis of the Dirac equation. The critical values $Z = Z_{cr}$ are found, and the existence of quasilevels for $\mathcal{E} < -m$ and Z_{cr} Z_{cr} is demonstrated, and an interpretation of them is suggested.

174. Alpha-Decay of Nonspherical Nuclei

Theory of Alpha-Decay of Nonspherical Nuclei," by V. G. Nosov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 7, Jul 60, pp 141-148

A consistent theory of α -decay of nonspherical nuclei is developed which is based on the corresponding generalization of the quasiclassical quantum mechanical approximation. Formulas are derived for the relative intensities of the α -ray fine structure lines and also for the α -decay constant and the angular distribution of α -particles emitted by oriented nuclei.

A new method is proposed for measurement of quadrupole polarization of oriented nuclei.

175. Dispersion Relations of New Reactions

"Dispersion Reactions and the Analysis of the Cross-Section Dependence Near the Thresholds of New Reactions," by L. I. Lapidus and Chou Kuang-Chao, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 7, Jul 60, pp 112-119

The application of the dispersion relations to an analysis of the dependence of the scattering (and reaction) amplitudes near the thresholds of new reactions is examined. General expressions are obtained which characterize the nonmonotonous variation of the forward scattering amplitude as a function of energy. The energy dependence of one of the amplitudes for elastic scattering of γ -quanta by deuterons near the photodisintegration threshold of the deuteron is considered.

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176. Giant Nuclear Resonance to Gamma Quanta

"Position of the Giant Resonance in the Dipole Absorption of Gamma Quanta by Atomic Nuclei," by V. G. Neudachnik, V. G. Shevchenko, and N. P. Yudin, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 7, Jul 60, pp 108-111

The giant resonance curves for a number of intermediate nuclei (Ca^{40}, V^{51}, Ni^{58}, $Cu^{63,65}$) are calculated on the basis of the shell model. It is shown that if spectroscopic data on the lower nuclei levels are employed, the shell theory calculations yield in a natural manner the correct position of the giant resonance.

177. Coulomb and Nuclear Scattering

"Interference Between Coulomb and Nuclear Scattering at High Energies," by B. P. Bannik and V. G. Grishin, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 7, Jul 60, pp 94-96

Interference between coulomb and nuclear scattering is considered in the quasiclassical approximation. Results of calculations are presented for scattering of 8.7 BeV protons on light and heavy photographic emulsion nuclei. The magnitude and sign of the real part of the amplitude for scattering of protons on protons are discussed.

178. Cyclotron Resonance in Metals

"Experimental Investigations of Cyclotron Resonance in Metals," by M. Ya. Azbel and E. A. Kaner, Physicotechnical Institite, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Experimental'noy i Teoreticheskoy Fiziki, Vol 39, No 7, Jul 60, pp 80-87

The results of some recent studies of cyclotron resonance in metals are discussed. Some additional opportunities for an experimental investigation of this phenomenon are indicated.

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179. C-12 (d,p) C-13 Nonstripping Reaction

"Angular Distribution of Protons From the C-12 (d,p) C-13 Reaction With 5-13 MeV Deuterons," by N. I. Zayka, O. F. Nemets, and M. A. Tserino, Institute "Rudjer Boskovic," Zagreb; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 7, Jul 60, pp 3-6

The angular distributions of protons corresponding to the ground state of C^{13} have been measured for five deuteron energies in the energy interval 5-13 MeV, as well as of protons corresponding to the three lower excited states for deuteron energies of 13.3 and 12.1 MeV. The parities and possible spins of the states have been determined. It is shown that with decrease of the energy, nonstripping reactions become more important.

180. $He^2 + H^3$ Reaction

"Investigation of the $He^2 + H^3$ Reaction," by Li Ga Youn, G. M. Osetinskiy, N. Sodnom, A. M. Govorov, I. V. Sizov, and V. I. Salatskiy, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 2, Aug 60 pp 225-229

The total cross section for the reaction $He^3 + H^3$ has been determined for triton energies of 150-970 keV with the aid of a thin gaseous target. In the indicated energy range, the total cross section increases from 3.2 to 63.0 mb. The ratios of the cross sections for various branches of the reaction have been measured as a function of the energy. The energy of decay of He^5 into an α -particle and neutron has been determined.

181. Proton Radioactivity

"Limits of Stability and Proton and Two-Proton Radioactivity of Neutron-Deficient Isotopes of Light Nuclei," by V. I. Gol'danskiy, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 2, Aug 60, pp 497-501

Application of isotopic invariance principles to light nuclei yields a very simple relation between the neutron and proton binding energies in distant mirror nuclei. On the basis of this relation, the limits of stability of neutron-deficient isotopes of light nuclei with respect to proton emission can be established, and the existence and properties of approximately 90 such isotopes can be predicted. Nuclei are indicated for which proton radioactivity or the very specific phenomenon of two-proton radioactivity can be observed. The chief properties of this interesting phenomenon are analyzed.

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182. Photodeuterons to Photoprotons Ratio

"Relative Yield and Energy Distribution of Photodeuterons From Copper," by A. P. Komar, Ye. D. Makhnovskiy, and V. P. Poddubov, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 133, No 4, Aug 60, pp 797-799

The ratio of photodeuteron yield from Cu to that of photoprotons and the energy distribution of these particles with maximum energy of the radiative capture gamma spectrum at 70 Mev were measured. The ratios were plotted in curves with maximum possible error indicated.

183. New Isomeric States of Eu-151

"New Isomeric States of Spherical Europium Nuclei With an Odd Mass Number," by E. Ye. Berlovich, V. N. Klement'yev, L. V. Krasnov, M. K. Nikitin, and I. Yursik, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 133, No 4, Aug 60, pp 789-792

The life periods of isomers of Eu-147, 149, 151 were measured at 624, 496, 197 kev. An analogy was found in the level diagrams of Eu-147, 149, 151, as well as monotoneous variations of level energies. The probabilities of transitions were determined. These results do not agree with the negative parity ascribed to the ground state of Eu-151 by K. Gottfried (Phys. Rev. 103, 1017 (1956)).

184. Conference on Electron and Ion Collisions

Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 8, Aug 60

The first All-Union Conference on Electron and Ion Collisions was held in Riga from 26 June to 3 July 1959.

The basic topic of the conference was inelastic collisions of electrons with atoms and molecules and processes occurring upon collisions of heavy particles, such as ionization, recharge, and formation and decay of negative ions.

The contents of the source are devoted to material presented at the conference.

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185. New Pulse Mass-Spectrometer

"A New Design of a Pulse Mass-Spectrometer of High Resolving Power," by B. N. Shustrov, Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 7, Jul 60, pp 860-864

A new design of a resonance magnetic mass spectrometer is described. The possibility of obtaining high resolving power upon one turn of ions along the drift orbit is demonstrated, leading to a considerable intensity rise of the output current. In the case of using a pulse source of ions, side peaks of the given mass (harmonics) are missing.

186. New Betatron Injector

"A New Method for Design of the Injection Process Into a Betatron," by A. P. Komar, G. F. Mikheyev, V. P. Fominenko, and N. N. Chernov, Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 7, Jul 60, pp 855-859

A new method of analyzing the electron capture into betatron operation with electron injection at a specified range, arbitrarily chosen, is described.

187. Improvements in Betatron Design

"Methods of Tuning Betatrons on Maximum Intensity," by B. B. Gelperin, V. D. Guskov, Kh. L. Luban, and N. N. Trofimova, Moscow Transformer Plant; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 13-17

Methods for correcting the characteristics of the magnetic field of the electromagnet of a betatron during its gamma ray generation are described. Schematics for optimal gamma ray intensity are given. The effects of their application on the intensity value are described.

188. Measurement of Pulse Currents

"Measurement of Position and Current of a Bypassing Pulse Beam of Charged Particles," by I. A. Grishayev, N. I. Mochechnikov, and I. F. Ivanov, Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 17-23

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A measuring instrument for the position and current of a bypassing beam of a linear electron accelerator is described. The accuracy of the position determination of the beam is not below 0.1 mm at a beam current $I > 1$ ma in a pulse and a pulse duration ≥ 0.5 μsec. The current measuring has a sensitivity up to 20 mv/ma and may be applied for measuring pulse currents from 5 to 10 μa in a pulse. The presented method of measurment can be applied to any pulse beams of charged particles.

189. Electrostatic Electron Spectrograph

"A General Purpose High Resolution Electrostatic Spectrograph of 75-kev Electrons, "by A. N. Kabanov; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 23-29

The construction of an all-purpose analyzer of electron energies in which the dispersing element is a single electrostatic lens with a flat symmetry is described. The resolving power of the analyzer is 150 000: 1 for electrons at 75 kev energy. The instrument may be used, as well, as an electron microscope, electronograph, and analyzer of ion energies.

190. Mobile Gamma Spectrometer

"A Mobile Automatic Single Channel Scintillation Gamma Spectrometer on Transistors," by A. N. Pisarevskiy, L. D. Soshin, and Yu. Ye. Selyaninov, Radium Institute, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 29-35

A mobile automatic scintillation gamma spectrometer on transistors with automatic feeding is described. The total weight of the equipment with batteries and its case is 20 kg.

191. Neutron Spectrometer

"A Spectrometer of Fast Neutrons According to Flight Time," by Ye. A. Zherebov and Ye. A. Tamanov; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 40-45

An apparatus for measuring time instants on a nanosecond diagram by the method of pulse recording is described. The pulse amplitudes are proportional to the measured time instants, with consecutive analysis of these pulses by a normal multichannel amplitude analyzer. The equipment is used for spectrometry of fast neutrons according to the flight time by using as neutron pulse source an ion accelerating

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tube for 200 kev. For the characteristic of the parameters, calibrated spectra of neutrons from reactions (d,d) and (d,t) and a test spectrum of inelastic scattering on carbon of (d,t) neutrons are given.

192. Neutron Source

"A Neutron Pulse Source," by G. S. Malkiel and B. I. Sukhanov; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 46-50

A neutron accelerating tube is described, giving 14 Mev neutron pulses of 10^{-6} to 10^{-8} sec duration with a recurrence frequency of up to 500 cycles. The instantaneous neutron flow during a pulse is 10^{12} neutrons/sec. A brief description is given of the electronic equipment for measuring the neutron energy by the method of flight time.

193. Mass Spectrograph With Double Focusing

"A Mass Spectrograph With Double Focusing on Full Scale for Measuring Isotope Masses," by V. Shyuttse, R. A. Demirkhanov, T. I. Gutkin, O. A. Samadashvili, and I. K. Karpenko; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 92-98

The construction of a mass spectrograph for all masses is described. The basic ion optical parameters of the system are the following: the ion deviation angle in the electric field $\Phi_e = 31^\circ 50'$, the ion deviation angle in the magnetic field $\Phi_m = 90^\circ$, and the radius of curvature of ions in the electric field $r_e = 510$ mm. Owing to large linear dimensions, high stability of the deflecting fields and a precision adjustment of lines of 1.5 to 2 μ wide were obtained, corresponding to a resolving power of 120,000. The dispersion varies for 1% mass within the limits of 0.25 to 2.25 mm. The use of a permanent magnet permits the realization of an even stability over the whole range of masses.

Solid State Physics

194. Infrared Photoconductivity of CdS

"Investigation of the Kinetics of Infrared Impurity Photoconductivity in CdS, Induced by Preliminary Illumination," by Ye. N. Arkad'yeva, L. G. Paritskiy, and S. M. Ryvkin, Physicotechnical Institute, Academy of Sciences USSR, Leningrad; Moscow, Fizika Tverdogo Tela, Vol 2, No 6, Jun 60, pp 1160-1168

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The photoconductivity of CdS monocrystals was studied at a temperature of 77°K in infrared range of 2 to 4 μ the type of photoconductivity appearing as a result of preliminary crystal excitation by illumination at a wave length corresponding to the intrinsic absorption. It is assumed that the infrared photoconductivity is related to electron transfer into the conducting zone with an adhering level where they are thrown by the illumination. A corresponding model was computed based on comparison with experimental results from investigations of kinetics of infrared photoconductivity; the cross section of photon capture by a charged center was determined, as well as the absorption coefficient of light in the infrared band and the filling of the adherence levels. In addition, the concentration of levels was evaluated, as well as their position in the forbidden zone and their cross section for an electron capture from the conducting zone.

195. Acoustic Plasma Oscillations

"Interactions of Acoustic Oscillations in Ionic and Electron-Ionic Plasma," by P. S. Zyryanov and Ye. G. Skrotskaya, Ural Polytechnic Institute, Sverdlovsk; Moscow, Fizika Tverdogo Tela, Vol 2, No 6, Jun 60, pp 1316-1320

It was attempted to compute the free path of phonons within the frame of a plasma model of a metal. This value permits the computing of phonon thermal conductivity and the relaxation time in a phonon system. The analysis was carried out.

Spectroscopy and Optics

196. Sensitized Fluorescence

"Quenching of Sensitized Fluorescence in Solutions," by B. Ya. Sveshnikov and L. A. Limareva; Moscow, Doklady Akademii Nauk SSSR, Vol 133, No 4, Aug 60, pp 807-810

A previous assumption by the authors (Optika i Spektroskopiya, Vol 9, No 2 (1960)) of a quenching of the excited acceptor molecules by the donor molecules was further investigated. The quenching of luminescence of mixed solutions by other impurities was also studied. It was found that at quenching by impurities, the luminescence of the donor in mixed solutions drops less, while the yield of the acceptor is higher in comparison with the yield attenuation of pure donor and acceptor solutions. These data provide a simple testing method, proving that a sensitized fluorescence exists in the tested solution.

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197. Depolarization of Luminescence

"Kinetics of the Concentration Depolarization of Luminescence and of the Intermolecular Excitation Energy Transfer," by P. I. Kudryashov, B. Ya. Sveshnikov, and V. I. Shirokov; Leningrad, Optika i Spektroskopiya, Vol 9, No 3, Sep 60, pp 341-348

It follows from the migration theory of concentration depolarization of fluorescence of solutions that in the region of concentration depolarization, the duration of the extinction of the radiation component parallel to the electric vector of exciting light ($\tau_{\parallel}$) is shorter, while the duration of the perpendicular component ($\tau_{\perp}$) exceeds the mean duration of fluorescence (τ_0) The relation $\frac{\tau_{\perp} - \tau_{\parallel}}{\tau_0}$ to the concentration of the fluorescent substance and the maximum value of this ratio are determined by kinetics of the energy transfer. Computations show that according to Vavilov's theory which assumes that the frequency of energy transfer does not depend on the interaction time, the maximum value of the specified ratio equals 0.225 at limiting polarization 0.42 (fluorescein). According to the theory by Foerster-Galanin, in which the frequency of energy transfer is inversely proportional to $\sqrt{t}$, the specified ratio equals 0.142. The experimental value was 0.12, i.e., close to the computation by Foerster-Galanin. The correctness and accuracy of the method were tested by studying the variation of $\tau_{\parallel}$ and $\tau_{\perp}$ in the case of Brownian rotational motion.

198. Photoluminescence of Alkali-Halide Crystals

"Kinetics of the Short-Lived Photoluminescence of Some Activated Alkali Halide Crystals," by I. K. Vitol and I. K. Plyavin; Leningrad, Optika i Spektroskopiya, Vol 9, No 3, Sep 60, pp 365-368

The effect of two lower excited levels of the activator ions Ga+, In+, Tl+, located in the lattice of KI, on the kinetics of the short-lived photoluminescence of the crystals KI-Ga, KI-In, and KI-Tl was analyzed. A good agreement of the theoretical and experimental data could be reached, which confirms the initial assumptions and permits the determination of some parameters of luminescent centers.

199. New Optical Systems

Optical Systems With Enhanced Resolving Power," by A. I. Kartashev; Leningrad, Optika i Spektroskopiya, Vol 9, No 3, Sep 60, pp 394-398

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Two new methods are described for obtaining an optical image, which at certain conditions will facilitate a resolving power higher than under the usual conditions for observing the optical image.

200. Study of Focal Surfaces

"Properties of Focal Surfaces of Mirror Spectrographs," by S. A. Khrshanovsiy; Leningrad, Optika i Spektroskopiya, Vol 9, No 3, Sep 60, pp 399-406

Properties of theoretical focal surfaces of spectrographic optical systems with spherical mirror of the chamber were studied. The character of variation of the shape of focal curves was established with respect to the position of the dispersing element. Simple relations were derived facilitating the study of the behavior of the curves under investigation and of their central (operating) part.

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